PERIODICAL DIVISION
JUL 19 1917



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No. 2

July 12, 1917

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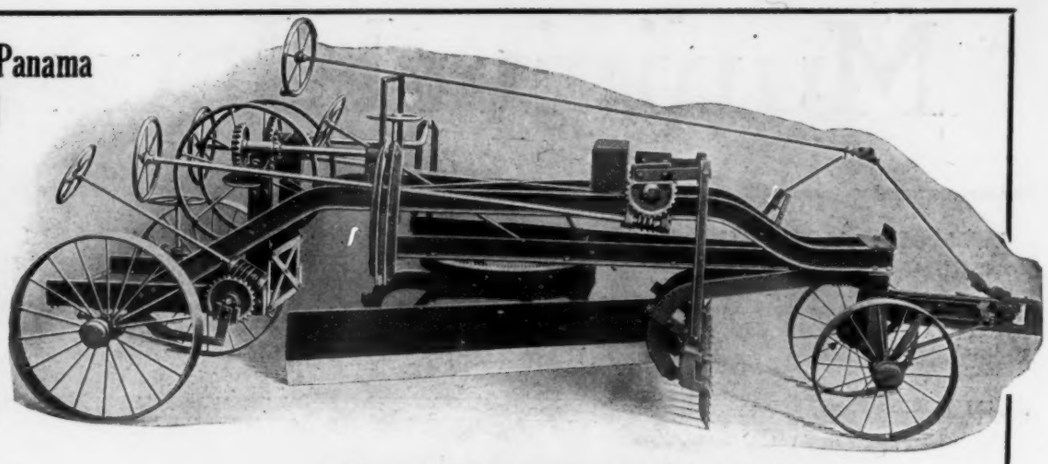
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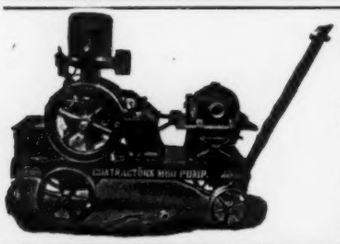
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Municipal Journal

Volume XLIII NEW YORK, JULY 12, 1917 No. 2

BUILDING THE ARMY CANTONMENTS

How the Sites Were Selected—Laying Out the Building Locations—Purchasing and Transporting Materials—Supervising the Work—Precautions Against Fire—Water Supply and Sewerage—Building Plans.

Although in few if any cases have the plans for the new army cantonments yet been completed, work upon them has already made considerable progress, the design and construction proceeding side by side because of the demand for their earliest possible completion. This would be impossible were it not that the construction in every case is being contracted for on the cost-plus-percentage basis; and so long as the contractor receives plans far enough in advance to order his materials and keep his men busy, he is not hampered and the work does not need to wait for the planning of future details.

The general planning for the cantonments consists in preparing designs for each of the several classes of buildings which will be required, these being standardized for all the cantonments and for given units of men. For instance, there is a standard barrack for a company of 123 men, and those built in the American Lake cantonment in Washington will follow the same plans as those now under way at Ayer, Mass. The same is true of the other buildings required. The differences in details will largely be due to those imposed by topography, and to a certain extent by climate, by the different facilities and necessities connected with the obtaining of water supply, the disposing of sewage, etc., the location of railroad sidings, rivers, main highways, etc.

THE SITE.

The camps were located originally by department commanders, whose recommendations were reviewed by the general staff, the latter reporting its decisions to Secretary Baker for final approval. While the sites were being chosen, Col. Littell's staff was designing a typical cantonment for each of the 16 divisions, planning the buildings, estimating the general sewerage and water requirements and doing everything that could be done before a map was available. As soon as a site was selected, a topographic survey was made of it, and data concerning possible sources of water supply and facilities for sewage disposal, railways and highways in the vicinity, etc., were obtained. As soon as this information had been mapped, the general layout of the camp was made and the contractor for each cantonment was given the information necessary to begin his preliminary work.

In choosing the site it has been considered desirable to have open and fairly level land for drilling, but this has in some cases been reduced to a minimum where the providing of it would entail large additional cost. In most cases the cost will probably be reduced by having the troops themselves do some of the clearing of land not required for the construction work.

Many of the cantonments have been located upon a porous soil, as this considerably simplifies the very important necessity of preventing the ponding of water on the area, without requiring any great amount of grading. One of the cantonments in the vicinity of New York, for instance, is on the sandy soil of the south shore of Long Island. Another is in New Jersey, in Burlington Co., where the soil is a sandy loam and the land slopes uniformly toward the Delaware river. In each of these locations there is an abundance of ground water which can be used for the water supply.

In laying out the buildings of each cantonment, brigade formations have been preserved so far as possible, and in no case have the buildings for one of the primary units been interposed among those of another primary unit. The buildings for the animals are generally separated from those for the men by the main trucking road. In all cases special attention has been given to provide fire breaks, usually by constructing wide roads, but in some cases by open spaces between buildings.

The construction within two or three months of a city for housing 40,000 men involves very serious problems of transportation of material, and the first work after the selection of a cantonment site was the construction of roads and railway sidings, absolutely necessary for carrying out the building program. While these are under construction, sufficient material and men are brought to the site for providing quarters for the laborers, numbering several thousand in each case. The first of the cantonment buildings to be constructed are therefore the barracks, including the kitchen and mess facilities, lavatories, officers' quarters and store houses and whatever works are necessary for water supply and sewerage. By the time buildings have been completed for housing the laborers, it is probable that the railway sidings and highway improvements necessary for transporting the lumber at the rate of millions of feet a day, and the other materials in similarly large quantities, will have been completed.

PURCHASING AND TRANSPORTING MATERIALS.

Before letting the contracts, the lumber sub-committee of the General Munitions Board interviewed representatives of the big lumber associations of the country and agreed with them upon a price for lumber for the cantonments, not to exceed an average of $20 per thousand. Independent mills can also furnish lumber for the cantonments, but the contractor is required to place at least 75 per cent of his lumber bill with the lumber sub-committee, that they may arrange with the lumber association for that amount of material. This committee has districted the United States and selected the

mills so located, from the point of view both of railroad facilities and of time of delivery, as to be best fitted for supplying the lumber to each cantonment. This arrangement will prevent contractors from bidding against each other and thus raising the price of lumber.

Other sub-committees have furnished Colonel Littell with statements of building materials that can be furnished by each dealer in the territory where each camp is located, and the prices of such materials and rates of delivery which can be secured. These data are furnished to the constructing quartermaster of each camp for the guidance of the contractor. The latter is expected, however, to buy in the local markets the small tools, minor equipment and materials needed, and the constructing quartermaster is ordered to give the contractor at all times "every assistance calculated to expedite his work and relieve him from hampering restrictions of any sort."

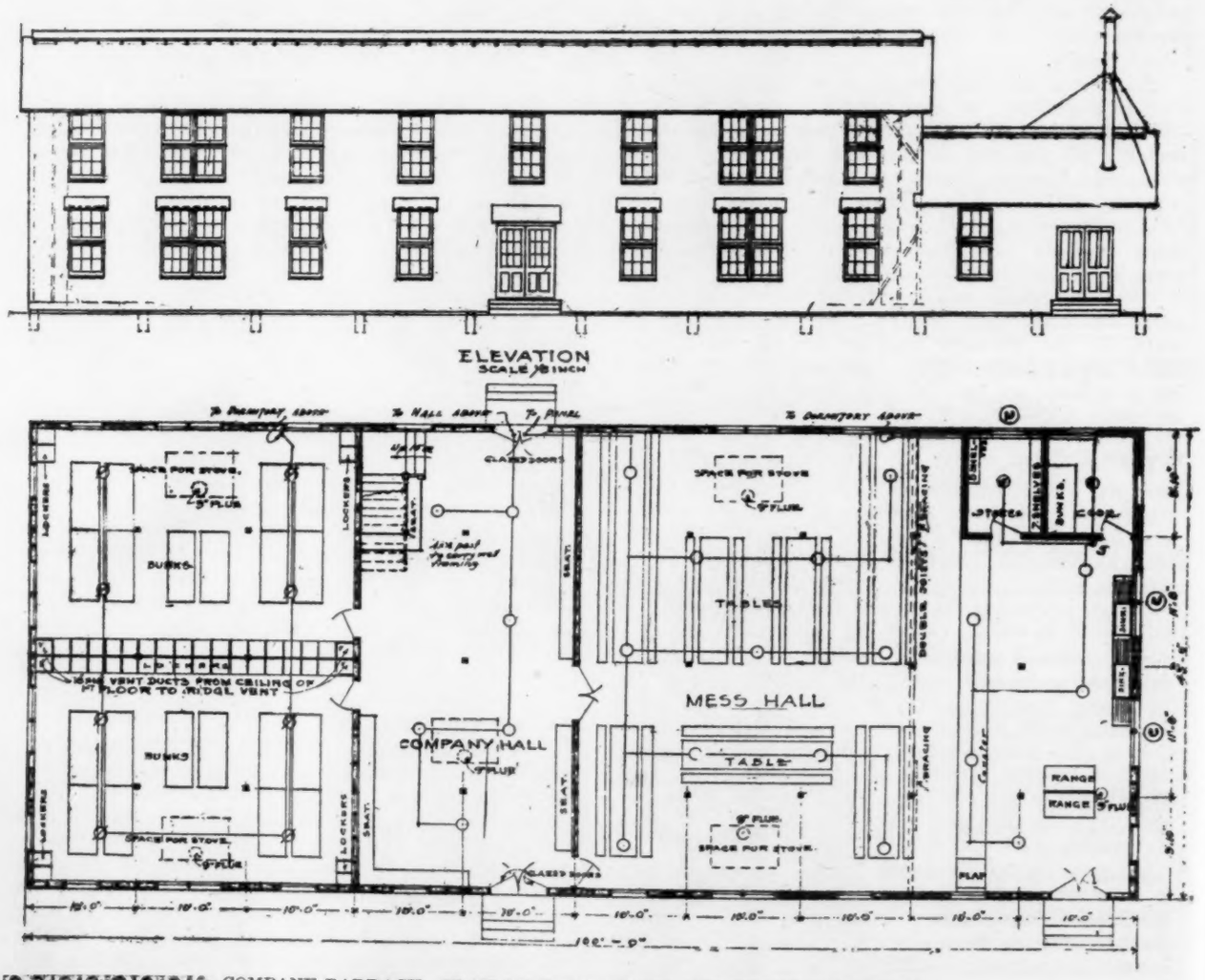
The transportation of materials is largely in control of the Commission on Car Service of the American Railway Association. The contractor furnishes certificates of the number and classes of cars needed to transport the materials for the camp, the points of shipment and the distance, and the approximate dates on which the cars are required. The Government furnishes a way bill envelope for each car, which will indicate to every yardmaster and trainman that the car is engaged in national service and must be moved without interruption. A representative of the railway on which the camp is located is stationed at the camp to expedite deliveries. If a shipper cannot secure cars for deliveries, Colonel Littell has authority to issue an order to the railway originating the business to supply the necessary cars.

SUPERVISION OF WORK.

The union scale of wages prevailing at the locality of the cantonment on June 1, 1917, is to prevail for that camp. The regulation of hours of work and overtime pay is fixed by agreement between the constructing quartermaster and the contractor, in accordance with conditions prevailing in that section.

From the beginning, the constructing quartermaster has an auditor on hand with an accounting staff, in order that the government may have complete knowledge of all items of cost involved in the payment on the contract.

In some cases the constructing quartermaster is a member of the Quartermaster's Corps, but others are members of the Officers' Reserve Corps who have won recognition as construction superintendents of the first rank; and each of the latter is relieved of military and administrative work for which his civilian experience did not train him by the presence of an officer of the regular army, who looks after the same. The constructing quartermaster has very large powers, being given



COMPANY BARRACK—PLAN OF FIRST FLOOR AND FRONT ELEVATION.

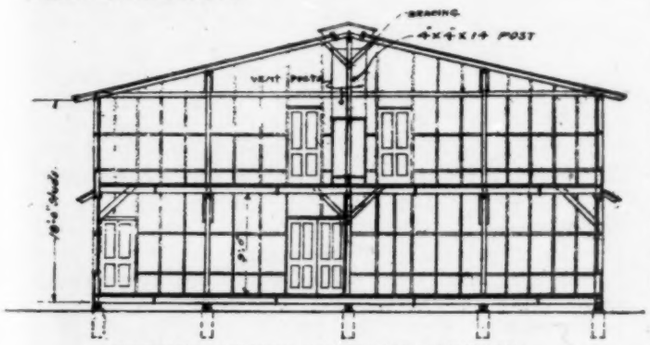
practically complete authority except as to the general instructions issued by Colonel Littell, in order that the speed of the work may be in nowise hampered.

A daily telegraphic report to Washington is to be made on each of the principal features of the work, and a regular weekly report will give a comprehensive view of conditions, weekly graphic charts showing the progress in the delivery of materials and in the construction of each class of structure.

PRECAUTIONS AGAINST FIRE.

Most of the cantonments will be located on land which must be cleared of trees and underbrush which, during the hot summer weather, would soon become quite inflammable; and, in addition, the entire construction will be of lumber, vast piles of which will probably be always present on the site. Consequently the fire risk will be considerable. It is required therefore that all brush, rubbish and dry grass be burned where building materials are to be stored, and for a distance of 300 feet around all storage yards and building sites. As soon as materials arrive, water casks and pails are placed where they will be convenient for use in extinguishing incipient fires and a continuous fire patrol is established. As soon as fire apparatus is received, fire companies are organized.

Smoking is prohibited wherever building construction is carried on or material is stored. Certain areas are designated where workmen may smoke at noon and smoking is permitted in a few buildings, where constant watch is maintained.



SECTION ACROSS COMPANY BARRACK.

Open fires on or near building sites are prohibited. All rubbish about buildings is collected daily and removed to a place where it can be burned safely. No open-flame lights, including candles, may be used in buildings, and to aid in enforcing this regulation the kits of plumbers, steam fitters and other mechanics are inspected before they are permitted on the job. Gasoline furnaces and torches must be kept in tool boxes or shanties outside buildings, and not more than three 5-gallon cans of gasoline are permitted on the job at a time. The use of charcoal for heating soldering pots is prohibited. No tar kettles or lead furnaces heated by wood fires may be placed within 50 feet of a building or lumber.

Boilers and internal combustion engines must be placed in detached iron-clad buildings. Boilers must not be set on wooden frames or platforms, and stacks into which engines exhaust must have screened tops. Power-driven woodworking machines must not be operated in buildings under construction or in sheds within 20 feet of such buildings. All electric wiring, even for temporary use, must conform to the national electric code.

WATER SUPPLY.

The minimum water supply for a cantonment has been fixed at 55 gallons per capita daily, equivalent to from 2,000,000 to 2,500,000 gallons per day for camps of 36,000 to 45,000 men. These quantities include the water required for animals and miscellaneous uses. Four pumping units are provided for, the smallest having a capacity of 750 to 1,000 gallons per minute. The capacity is required to be such that on three minutes' notice water can be furnished for one hour at 2.85 times the minimum rate.

The distribution system is designed for pressures of from 60 to 85 pounds. Within the camps, machine-wound wood stave pipe is to be used for most of the distribution system, about 50 tons of cast iron pipe for curves and other special requirements and another 50 tons of specials being used, and cast iron pipe being used to bring the water from a distance to certain of the camps, as the one at Columbia, S. C., where the government will use 4,500 feet of 16-inch cast iron pipe and the city will lay 15,000 feet more.

Water is to be obtained from the cheapest available source of satisfactory character. In some cases it is brought from existing water works and in other cases independent plants are constructed. Storage will generally be required to meet the peak load requirements for an hour's draft at the rate of 156¾ gallons per capita per day. To meet this requirement, either elevated tanks of 300,000 gallons capacity will be provided, or a reservoir of at least 1,000,000 gallons capacity, from which water can be pumped directly into the mains.

In order to reduce the waste and unnecessary consumption to a minimum, the following regulations are to be enforced:

(1) All fixtures shall be shut off when not in actual use.

(2) The fire drill regulations shall make it the definite duty of certain designated individuals to shut off, as soon as a fire alarm is sounded, every fixture from which water may be drawn for purposes other than fire fighting, except those necessary for cooking purposes.

(3) The several brigade units in each cantonment shall make use of the showers at different hours, so that the very heavy peak load resulting from the simultaneous use of all the showers may be avoided.

(4) The use of water for sprinkling roadways and grounds and for the animals shall be so timed as not to coincide with the peaks resulting from the heavy draft for the showers.

SEWERAGE.

In general, the sewerage system of each cantonment will remove house sewage only, although in a few cases surface water may be admitted through catch-basin inlets. The kitchen plumbing includes grease traps to minimize deposits in the sewers. Six-inch pipe will ordinarily be used for kitchen connections, although 4-inch may be used where this size is unavailable.

The trunk sewers are designed on the assumption that the maximum flow at any time will be the maximum from one brigade plus the normal amount from all the other units. The maximum flow from one regimental unit is taken as 1.5 cubic feet per second and the normal flow as 0.5 cubic feet per second. A brigade of three regimental units will therefore furnish a maximum of 4.5 cubic feet per second and the remaining regimental units will furnish 0.5 cubic feet each. Minimum grades are to be obtained, if possible, which will give a velocity of two feet per second when the sewer runs full; but a velocity of 20 inches per second is permitted in special cases. In wet ground and wooded areas special joints are required to prevent seepage and the entrance of roots. Manholes are placed at intervals of from 300 to 500 feet. Vitrified pipe will be used in sizes varying from 6 inches to 24 inches.

Where circumstances permit, the sewage of a can-

tonment will be discharged into adjacent streams without treatment. Where treatment is necessary, it will consist in most cases of discharge into septic tanks holding about 10 gallons per capita, to be located at least 300 feet from the nearest occupied building. These septic tanks will be constructed of wood or of concrete, as the constructing quartermaster may decide. In a few cases intermittent sand filtration will be employed, but in most cases the effluent from the septic tanks will probably be applied to trickling filters 6 feet deep, having an area of about an acre for each 30,000 persons. Settling tanks will be provided to clarify the effluent from the trickling filters, and eventually some method of providing for the disposal of the sludge from these tanks and from the septic tanks must be provided. If, after careful study of conditions, the local conditions seem to demand it, the efffuent from the treatment plants will probably be disinfected by some chlorination process.

CANTONMENT BUILDINGS.

Each cantonment will comprise about 1,000 timber structures, some more, some less, of the simplest possible character, and unpainted. A few buildings used for storage and as garages and power plants will probably be metal clad, and possibly corrugated iron siding and roofing may be employed for them. These are some of the details which have not yet been perfected.

Where buildings are supported on posts more than 15 inches above the surface of the ground and it is possible to keep the ground below them free from inflammable rubbish, the sides will not be boarded down to the ground; but this is to be done where the clearance is less than 15 inches, except in the South, where it is necessary to omit this precaution against fire on account of the greater importance, from a sanitary viewpoint, of permitting a free circulation of air below the floor.

In the South, the two-story building used for large barracks will be heated by stoves on the lower floor, as is done in the Canadian cantonments. It is proposed to jacket the stoves so as to increase the circulation of air and to carry the stove pipes directly up through the second story and roof. Drums will be installed in this stove pipe with air jackets around them, for heating the second story. (This construction is shown in the general plan of a company barrack reproduced herewith.) The smaller buildings in the South will probably be heated by small direct-radiating stoves. In the northern cantonments it is probable that central heating stations will be built and the buildings warmed by radiators.

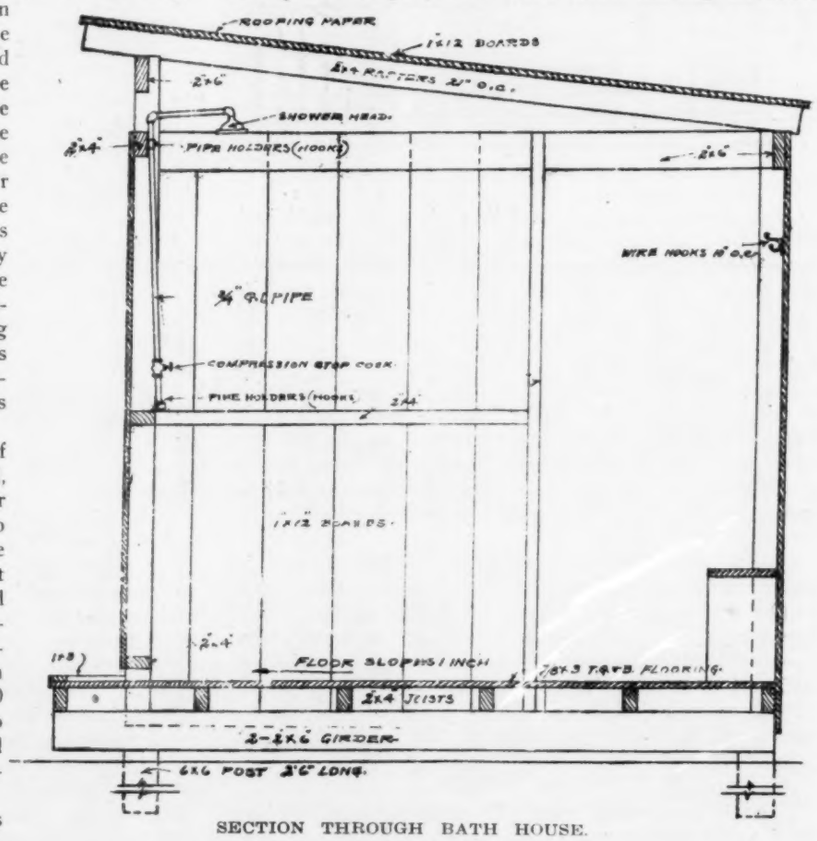
On account of the danger of fire if other sources of light were employed, electricity will probably be used for lighting the buildings, although no money is now available for this. The peak load for lighting is estimated at 600 kw. and the maximum power load at 300 kw. The electrical materials required for the 16 cantonments comprise, among other items, more than 4,000 miles of insulated wiring, 29,500 wire guards for lamps, 250,000 lamp shades, more than 50 miles of lamp cord and other electric fittings in proportion.

It is proposed to use two steel ranges in each large barrack, and cook stoves in the smaller barracks. The kitchens will require 8,000 grease traps, the same number of cast iron sinks and 6,000 range boilers.

The Quartermaster's Department has estimated that the amount of building material required in each of the cantonments will be about as follows: 5,600,000 feet b. m. of boards and 7,800,000 feet of dimension stuff, 177,000 feet of 4 x 4's, 2,800,000 feet of flooring, 1,200,000 feet of siding and 1,400,000 feet of matched boards. This applies to the southern states, while in the northern cantonments the amount of lumber will be increased by about 216,000 feet b. m. In a southern cantonment there will be required 2,500 kegs of nails, 4,800 rolls of sheathing paper, 6,300 squares of 1-ply roofing, 21,900 squares of 2-ply roofing and about 2,110 rolls of tarred felt. In the northern cantonment the amount of 1-ply roofing will be reduced to about 800 squares, while the tarred felt will be increased to 3,200 rolls. Concrete work will require 4,700 barrels of portland cement, 1,400 cubic yards of sand and 2,500 cubic yards of broken stone or screened gravel. The plumbing of each cantonment will require about 100,00 feet of ⅜-inch to 2½-inch galvanized pipe, 1,250 nipples, 2,000 unions, 14,000 fittings, 1,900 shower bath heads and numerous other plumbers' pipes and fittings.

Probably most of the garbage will be burned in incinerators, but studies are being made to ascertain if the fats can be recovered at a cost that will warrant doing so.

The barracks for the men are generally two-story buildings, 43 feet wide, and of different lengths, depending upon the number of men to be accommodated. At one end of each is a single-story kitchen and a pantry and sleeping room for the cooks. A long counter separates the kitchen from the mess hall, where the men living in the barrack will eat. In the center of the first floor is a company hall with doors leading outdoors



SECTION THROUGH BATH HOUSE.

on each side of the building and a stairway to the floor above. This company hall separates the kitchen from the two first-floor dormitories. The second floor is divide up in the same way, except that two more dormitories take the place of the company hall on the first floor. It was originally proposed to have the men sleep in double-deck bunks, such as are used on large construction work and in some college fraternity houses; but the medical advisors of the Secretary of War reported so strongly against this that ordinary metal cots will probably be used and the size of the buildings increased to furnish the necessary space. The first story is made nine feet high from the floor to the bottom of the beams of the second story. The dormitories are separated by partitions so that the men in each are comparatively isolated from the others, which is considered desirable by the army medical department.

There is a ventilating opening running the entire length of the ridge of the building, to which vertical vent ducts run from the floor below. Each building has a large amount of window area and the sash can be slid to one side to secure ventilation. Lavatories for both officers and men are provided in small detached buildings.

The officers' barracks vary considerably in size and shape. Some are long single-story buildings with a kitchen at one end, next to this a mess room and then a long hall down the center, and opening from it on each side rooms 10 feet 6 inches by 8 feet 4 inches, and an office at the further end of the hall. Other barracks are small single-story buildings, with kitchen, mess room, and from 2 to 4 individual rooms.. Still other buildings are two stories high, the larger rooms shared by two officers, containing an office, mess room and kitchen. A few of the officers' barracks will have no kitchen or mess room.

Bath houses of different sizes are to be provided, varying from two showers to ten showers each. The two-shower house will be 7 feet long and is estimated to accommodate from one man to forty men; and in general two showers will be provided for each forty men or fraction thereof. The two- and four-shower buildings will contain one light each and the larger buildings will contain two lights each. Each of the buildings will be 9 feet deep, and 7 feet front for each two showers. As shown by the accompanying section, there will be a seat at the front of each bath house, and over this iron hooks for holding the clothes of the bathers. At the rear will be a ¾-inch galvanized iron pipe for each shower head, rising to the top of the bath house, where it will be provided with a shower head, the pipe being fastened to the rear of the building by steel hooks. About 4½ feet above the floor will be a compression stopcock for regulating the discharge from the shower. The entire building will be of 2 x 4's and ⅞-inch boards, except the 2 x 6 girders upon which the floor rests and 2 x 6's used for the main members of the framing. The floor slopes one inch in nine feet toward the rear, where there is an opening two inches high through the rear wall by which the water can escape. The roof is made of 1-inch boards covered with roofing paper. There are two entrances to each bath house, at the two ends, adjacent to the front of the building.

All of the construction work of the cantonments is to be done on the fee system, or cost plus percentage basis. The fees vary from 10 per cent on the small contracts of $100,000 or less to 6 per cent on contracts of more than $3,500,000, the total fee to any one contractor in no event exceeding the sum of $250,000. This system of awarding contracts was decided upon for several reasons. One of these was that time would not permit the completion of drawings and specifications for the cantonments before the contracts were let, and this permits changing plans after the letting of the contract should such be necessary. The schedule of fees was decided upon after several weeks of study and conference with large contracting firms, which, with few exceptions, acquiesced willingly in the condition that the profits must be kept down to the lowest level consistent with high-grade work. Some firms offered to do the work on a cost basis, but this was considered to be an unwise policy, both economically and nationally, since free service might disrupt the high grade contracting firms best qualified to do the work effectively.

The work involved in each cantonment is not confined to the area covered by it. In most cases new railroad spurs must be built, heavy rails substituted for the lighter ones now in use in existing tracks, sidings built in the vicinity, highways built or improved to provide for trucking, and every possible provision made for handling the enormous amounts of materials without an hour's loss of time. Special telegraph and telephone lines and other facilities are being provided to connect each cantonment with district army headquarters and with Washington.

(To be continued)

QUICK WORK BY SAN DIEGO WATER DEPARTMENT.

These days see rapid work being done in all parts of the country in preparing cantonments for the new army. One such instance is described by F. H. Lockwood, manager of the water works of San Diego, California, in his May report as follows:

"On May 25th information was received that an army cantonment would be established at Linda Vista, and a request for an immediate supply of water was made by the officer in charge. A temporary supply was furnished the following morning by hauling water from the Pueblo farm in tank wagons. In the meantime work was rushed on the installation of a pump at a supply cistern at the Linda Vista station, to which water was shipped via Santa Fe; some 500 feet of pipe was laid to the camp site, and within twenty-four hours after word was received the water was on tap at the camp."

The city has also made arrangements to care for the garbage from this camp, which will be fed to hogs.

THE ENGINEERING COUNCIL.

What is known as the Engineering Council was organized on June 27th, in the rooms of the American Society of Mechanical Engineers, in New York City. This body is a department of the United Engineering Society, serving as a medium of cooperation between the American Societies of Civil Engineers and of Mechanical Engineers, and the American Institutes of Mining Engineers and of Electrical Engineers. According to the by-laws of the United Engineering Society "the Council may speak authoritatively for all member societies on all public questions of a common interest or concern to engineers." The Council is composed of 24 members, 5 from each of the 4 societies named and 4 from the United Engineering Society. The officers elected at the organization meeting were: president, I. N. Hollis, of the A. S. M. E.; vice-presidents, H. W. Buck, of the A. I. E. E., and George F. Swain, of the A. S. C. E; secretary, Calvert Townley, of the United Engineering Society. The executive committee consists of the 4 officers named, together with P. N. Moore, of the A. I. M. E., and D. S. Jacobus, of the A. S. M. E.

At this first meeting, the members of the Council, desirous of helping the government in the prosecution of the war, instructed the executive committee to cooperate with the government in procuring the services of engineers, and also appointed a committee consisting of Messrs Buck, A. M. Greene, Jr., and E. B. Kirby, to consider the best means of utilizing the inventive ability of the members of the founder societies in assisting to the same end.

COVERED RESERVOIR OF REINFORCED CONCRETE*

Built for Mankato, Minn., Water Works—Circular, with Conical Shaped Roof—Designing the Reinforcement—Construction Details.

The reservoir described in this paper was built at Mankato, Minn., in 1916. It is circular, 100 feet in diameter and 25 feet deep, with a capacity of 1½ million gallons, and is covered with a conical-shaped reinforced concrete roof. It was built on a hill composed of red and blue clay. The floor is about 17 feet below the original ground line and the filling around the walls extends to the height of the high water line, which is about 8 feet above the original ground line.

Special attention is called to the following features: 1. The circular plan. 2. The amount of horizontal reinforcement in the walls and the consideration given the earth pressure on the walls to offset the tension due to the inside water pressure. 3. The conical roof instead of a flat slab. 4. Expansion joints between floor and wall. 5. The provisions made for cleaning.

Circular Plan. Where a reservoir is built entirely in solid ground and the outside earth takes the pressure of the water against the walls, no reinforcement is necessary because of this pressure and a square or rectangular plan will somewhat reduce the cost of construction because of less expensive centering. But when the reservoir is empty, the earth pressure on the outside will create stresses in the walls opposite to those caused by the inside pressure when filled. For this reason reinforcement is necessary to take care of this negative stress, unless some other means is provided, such as a gravity wall or other form of construction.

If horizontal tension in the walls is to be taken care of by reinforcement, the circular wall requires the least amount for a given internal pressure. It will also counteract the thrust of the outside earth against the walls when the reservoir is empty without producing tension in any part of the walls. It may be said in passing that the outside thrust against the walls in some instances may be very large, especially if the earth has been saturated by water from leakage or other causes.

The circular types of construction cost more per cubic yard than the square or rectangular, but the saving in reinforcement and in volume of concrete or masonry is sufficient to offset the differences in cost. Therefore I believe the circular plan is the better to adopt in all cases where space will permit its use.

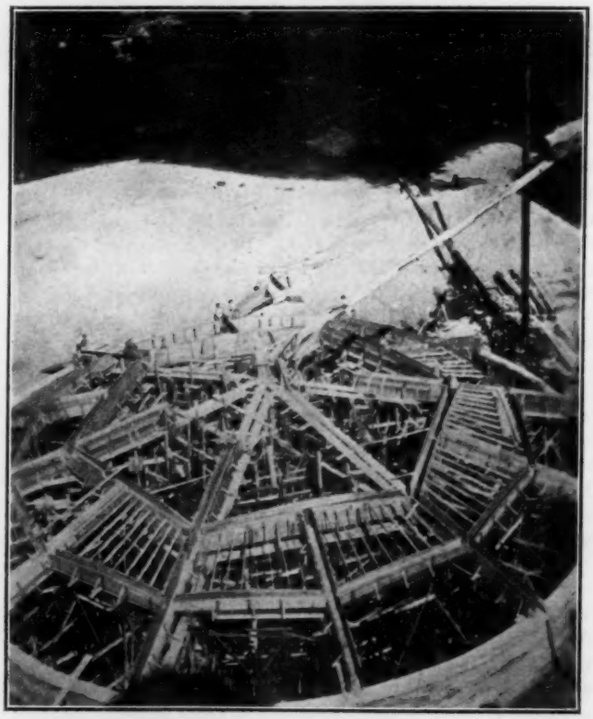
Where a covering over a reservoir is desirable, the cheapest construction, if concrete is used, undoubtedly is a flat slab; it may, of course, have pitch to provide proper drainage. The method of supporting the roof will depend on the depth, size and shape of the reservoir. If the reservoir is not deep, a large number of pillars from the bottom will reduce the size of beams, and vice versa. To find the most economical construction, each case must be studied by itself. There will always be a certain length of span at which the cost of construction will be the minimum. The most economical condition must be found by trials and estimates in each case.

There are instances, however, when economy must give way to some other desirable features. Too little attention has been paid in this country to the aesthetic features of permanent structures. In the use of concrete, the general appearance of a structure may be greatly improved at very little cost above a strictly economical design. In this case, after some consideration to the aesthetic side of the result, it was decided that the most desirable covering was a conical shaped concrete roof supported by reinforced concrete beams inclosed with a curtain wall above the top of the wall proper. The roof rests on the outside walls and seven pillars, one placed in the center and six in a circle 60 feet in diameter around the center pillar, making the longest beams 30 feet in horizontal length between centers of support.

The roof slab is 4½ inches thick, being 4 inches of 1-2-4 concrete and ½ inch of mortar coating troweled to a smooth, hard finish. The roof slab is reinforced with ⅜-inch steel rods 8-inch centers laid one way only, and with a network of steel wire netting of 4-inch mesh with double No. 8 wire longitudinally and No. 12½ crosswise. The amount of reinforcing is sufficient to carry a loading of 100 pounds per square foot of surface, besides its own weight. The roof beams are arranged about 12 feet apart.

In the resign of the roof slab no consideration was given to the arch action of the slab due to the conical shape of the roof. This is a variable amount at different places of the roof, and while it would be sufficient to consider in calculating the amount of reinforcement, it was not taken into account; its value will therefore go toward increasing the factor of safety.

The necessary amount of horizontal reinforcement in



FRAMEWORK FOR ROOF BEAMS.
Beneath may be seen support for roof centering.

*Slightly abbreviated from a paper before the Minnesota Surveyors' and Engineers' Society, by H. F. Blomquist, city engineer of Mankato.

the walls, depending upon the amount of earth pressure that may safely be taken to neutralize the stress due to the inside water pressure, will of course depend on the nature of the ground and the care exercised in filling around the walls after the forms are removed. With care in refilling the clay soil, the earth thrust ordinarily is more than sufficient to counteract the pressure due to water extending from the surface of the ground to a given point in the wall. There would, however, be certain times when the upper layer of the earth, say the surface layer about 6 feet thick, would not act as a support to the walls, because, during very dry condition of the ground, contraction takes place in it so that it recedes from the adjoining surfaces. This is also true in very cold weather when the ground freezes.

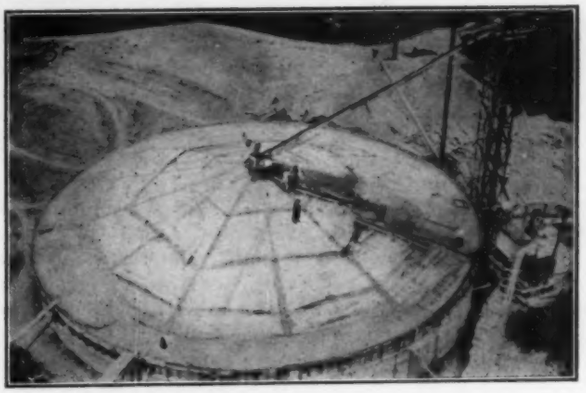
For this reason no support from the upper 6 feet of the ground surface should be assumed. In our design the horizontal reinforcement in the upper 15 feet of the wall is sufficient to take the entire tension due to the inside water pressure at a unit stress of 16,000 pounds per square inch, with a surplus amount near the top to take care of ice thrust in case of ice formations on the water. The reinforcement in the lower 10 feet of walls is not sufficient to take all the tension at 16,000 pounds as a unit stress. About 40 per cent of the tension is here assumed to be taken up by the outside earth thrust, and with no tension being assumed in the concrete it is safe to assume the design has the proper factor of safety.

The floor consists of 10 inches of concrete reinforced with ⅜-inch rods laid both ways 9 inches apart. The floor was constructed after the walls and roof had been completed. A ¾-inch expansion joint connects the floor and walls, also the floor and pillars. This joint was caulked with oakum, and filled with an asphalt filler. The floor slopes from the walls toward the center, being 18 inches lower at the center than at the walls.

METHOD OF CONSTRUCTION.

On account of the firmness of the ground, it was intended to trim up the sides after the excavation had been made so that no outside forms would be necessary for the walls below the surface of the ground. But hard rains during the time of excavation caused some slides to occur so that forms were needed for about half of the walls.

After the excavation had been completed, we built the forms for the entire wall and the six large roof beams radiating from the center, also the supports for the centering of the roof, before any part of the wall, except the foundation below the floor line, had been poured. The reinforcement was placed in the wall at the time of building the forms, and was supported by two 2-inch angles laced together for this purpose. These supports rested on the concrete foundation already poured for the walls, and were placed at intervals of 10½ feet and carried the entire horizontal reinforcement. These angle supports, together with ¾-inch rods 2 feet apart, form the vertical reinforcement of the walls.



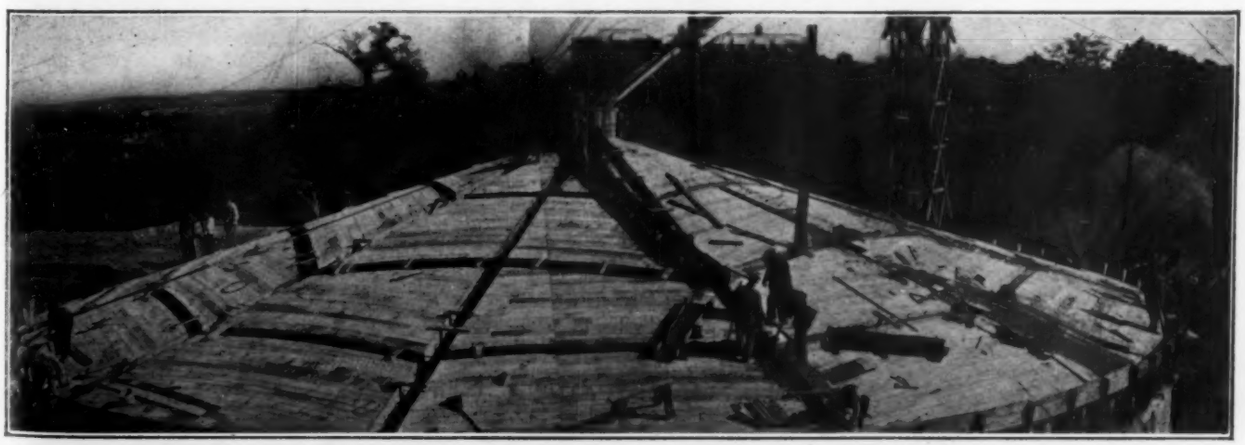
POURING ROOF SLAB BY CHUTE FROM TOWER.

All the concrete for the entire structure, except for the foundations and the floor, was distributed from the hopper at the center of the roof, the radiating forms for the roof beams acting as chutes to different points around the wall.

The mixer was placed in a pit below the surface of the ground near the wall and the concrete hoisted in a tower about 60 feet above the surface of the ground, from which it was run through an inclined chute to the hopper at the center of the roof.

All the material was on the ground before pouring of the walls was commenced, because they were to be poured in a continuous operation to avoid horizontal seams forming where concrete would set between pourings if done intermittently. The sand and crushed stone was taken from the material bins to the mixer in dump cars.

The pouring of the walls was done in four days and four nights without stopping the mixer at any time for more than one hour, and the concrete deposited at different points around the wall in rotation so that no part of the surface had set before new concrete was added. Small openings in the forms were left for working the



ROOF CENTERING IN PLACE. POURING A ROOF BEAM.

concrete in the walls to prevent voids, and these were closed up as the filling progressed.

The walls are 24 inches thick at the bottom and 15 inches at the top.

After the walls had been completed, the forms for the roof beams were cleaned and completed and the centering laid for the entire roof slab before the beams were poured. The centering for the roof slab was all supported by staging from the bottom. The form work, centering and supports for roof beam and slab required about 100 thousand feet of lumber, but the greater part of this did not require cutting, and therefore the waste was not more than about 15 per cent.

The reinforcement was then placed in the beams and all the beams and curtain wall poured. After the beams had been completed, the reinforcement was placed for the roof, and the concrete afterwards poured. The concrete was mixed sufficiently stiff to prevent sliding or running when placed on the inclined roof, which has a rise of 15 feet in 50. The roof slab was finished with a ½-inch mortar surface trowled to a hard, smooth finish.

The mixture of the concrete in the foundations is 1-2-5, and of all the walls, roof and floor is 1-2-4. Crusher-run limestone passing a 2-inch ring was used for the coarse aggregate. As an aid toward waterproofing the concrete in the floor, walls and roof slab, 20 pounds of hydrated lime was used with each barrel of cement used, the lime being first thoroughly mixed with water.

For waterproofing the concrete surfaces, two plastering coats were applied, consisting of 1 to 2 cement mortar to which was added Truss-Con Waterproofing Compound, and then the surfaces given a brush washing of cement grout.

Provisions are made for draining out all the water in cleaning, and since there is a separate system of water supply for the hill district, a 4-inch pipe line from this system was laid into the reservoir and provided with a 2½-inch fire hose nozzle so that a fire stream of 60 pounds pressure may be used for cleaning.

The reservoir has been in use about two months and no visible leakage has so far taken place.

The work was done by the J. B. Nelson Construction Company of Mankato under contract at a cost of $19,373.

The new reservoir is used in conjunction with the old masonry reservoir of about 800,000 gallons capacity, and was constructed primarily for the purpose of increasing the storage capacity of the waterworks system for fire protection.

BRIDGE MAINTENANCE IN PHILADELPHIA.

During 1916 the first permanent floor laid by the city of Philadelphia upon a structure not originally designed for an improved type of pavement was constructed in the form of a new wood block pavement on the Calumet street bridge. In constructing this pavement the old wooden floor beams were replaced with steel I beams, on which was laid a waterproof sub-deck of 4-inch yellow pine. On this sub-deck were then laid the wood blocks, having previously been dipped in a hot bituminous compound. The blocks were laid loosely and an expansion joint was provided along the curb line. At intervals of twenty feet a transverse angle iron was laid from curb line to curb line in order to overcome the creeping tendency so noticeable in wood block floors on bridges. Where wood block is not practicable, the city uses 4-inch white oak laid diagonally. Although this loses its smooth appearance more quickly than yellow pine, it is more desirable on account of its toughness, its ability to resist abrasion and its greater tensile strength.

Like most other cities, Philadelphia finds its iron and steel bridges deteriorating rapidly where they pass over steam railroads, owing to the effect of sulphurous gas and locomotive blasts. How best to prevent this is still an open question in that city. The erection of wooden smoke shields over track lines, while it permits free air to circulate around the structure, requires almost constant attention to keep them in order. On the other hand, the erection of steel blast boards over a trackage area equal almost to the total area of the bridge from abutment to abutment is found to be almost prohibitive on account of the high initial cost. No more effective means of protecting the metal work has yet been devised than a systematic cleaning and painting of the structures, provided, of course, that this is done at regular intervals.

The progress of bridge designing during the past twenty years has been such that it is estimated an ultimate saving would result if all the bridges of the city of the girder type of construction with wood floors and of 150-foot span or less were to be replaced with steel encased in concrete. None of the bridges constructed in this way since 1900 have cost the city one cent for maintenance up to date. Concrete arches and concrete-encased girders built on the improved designs of the last ten years have shown no evidence of wear or deterioration, justifying the increased initial cost of these types of bridge structures.

MILITARY ROADS IN FRANCE.

Information under date of June 5th has been received from the battle front in France, near Bapaume, in a letter written to George C. Warren, president of Warren Brothers Co., written by W. G. MacKendrick, Lieut.-Col. and Assistant Director of Roads, president of the Warren Bituminous Paving Co. of Ontario. Col. MacKendrick has been connected with military road construction at the front for about two years, and gives some very interesting narratives concerning some of his work in that connection, from which we have prepared the following brief statement.

Roads in the vicinity of the battle front in France and Belgium are macadam, some having stone blocks on sand foundation in the center of the road; except that in towns and villages the main street is generally of such stone block, or stone "setts." The macadam is of light construction, generally 4 to 6 inches of gravel or stone and a few inches of chalk or sand, and they go to pieces quickly under the 3-ton and 5-ton trucks, guns, etc., which are continually using them within the army areas. As a result, the road force of several thousand men is kept constantly busy, especially in the fall, winter and spring, trying to keep them in a passable condition by the use of slag, mine refuse, chalk, old bricks from destroyed villages, or anything that can be had. In swampy places or bad mud holes, railroad ties are used, spiked down onto three longitudinal stringers, or 3-inch planks in place of the railroad ties.

In building new roads, telford macadam was used, but it was found that the soil was too soft for the ordinary method of construction, the huge trucks driving the large stones of the base into the soft soil, and consequently it was found better to lay the large stone on their sides rather than standing them upright. The macadam was placed on top of these, mud from the side of the road being used as a binding material. In winter the traffic has to compact this macadam surface, since rollers block the traffic too much and are apparently impracticable. The road from Albert to Bapaume was rebuilt and recoated in this way, and carried all of the army traffic until May, after which a regular coating of macadam was put on,

and eight road rollers working two shifts per day put it into shape.

Time is the factor in all advance work, as from the minute an advance is made by the infantry the guns must go up in support and munitions must be kept constantly serving the guns; consequently anything practically available is used in keeping up the roads. Brick from destroyed buildings in the nearest village is the favorite material. The traffic grinds this into powder, and in wet weather into mud, so that it has to be renewed every day or two, but was found to be the best that could be obtained, considering that stone cost $7.50 a ton and wasn't available at any price. In bad, muddy spots, trees, old sleepers, rafters and other timber from houses in demolished villages, anything that will help to make a solid roadway and enable guns and regiments to keep moving, is used for the purpose. In some cases the roads first built could be used only for horses pulling in ambulance carts, and limbers could not be taken in for several days or even weeks. Col. MacKendrick stated that he had had 10,000 to 12,000 men working for many months and used as much as 2,000 tons of road metal a day, not counting corduroy, railroad ties, pit props or brick. When possible, the method employed is to fill holes with broken bricks until level with the surface and then cover the entire road with 4 to 6 inches of macadam. These holes are not always or even often those made by the traffic, but are most frequently caused by the enemy's shells; in the worst spots some 80 to 90 per cent of the road being torn up by shell fire. All the time that this repair work is being done the traffic must be kept going, moving in both directions on roads 16 to 18 feet wide.

The Colonel states that what is wanted in the road engineering force in France is adaptable men who can secure results with any old thing they can lay their hands on. The cost of the work is a small item; labor is apparently abundant, Boche prisoners being used for this work to a large extent.

PRIZES FOR PAPERS ON PLUMBING.

On August 1, 1916, through the courtesy of the Cast Iron Soil Pipe Maker's Advertising Association, three prizes known as the "The Nelson Prizes in Plumbing" were offered for the best papers on subjects having to do with the theory or practice of plumbing. The committee in charge consisted of George C. Whipple, Professor of Sanitary Engineering, Harvard University, Cambridge, Mass.; Dwight Porter, Professor of Hydraulic and Sanitary Engineering, Massachusetts Institute of Technology, Cambridge, Mass.; Gifford LeClear, of Densmore & LeClear, Engineers and Architects, Boston, Mass.; and Harry Y. Carson, of the Central Foundry Co., New York City.

Chairman Whipple has announced that the prizes have been awarded as follows: First prize, $100, awarded to Thomas J. Claffy, assistant chief Sanitary inspector, Health Department, Chicago, Ill., for a paper entitled "Plumbing." Second prize, $50, awarded to James W. Anderson, student, graduating in the class of 1917 from the Massachusetts Institute of Technology, Cambridge, Mass., for a paper entitled "A Study of the Different Types of Pipes used in the Disposal of Rain Water from Buildings." Third prize, $50, awarded to Walter G. Ward, instructor, North Dakota Agricultural College, Agricultural College, N. D., for a paper entitled "Water Closet Connections."

These prizes were offered to students or instructors in any institution of learning who have had training in the theory or practice of house drainage, also to any who have had practical experience in installing house drainage systems. It is planned to offer $750 in prizes in a similar contest next year, possibly also a fellowship in Harvard University. The desire is to bring out in these papers defects in existing practice and feasible improvements therein.

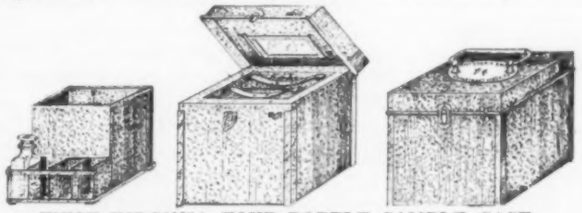
SHIPPING WATER SAMPLES

Description of the Four-Bottle Case Furnished to Cities by the State Board of Health of West Virginia for Sending Samples.

The Division of Sanitary Engineering of the State Board of Health of West Virginia has adopted a standard container for shipping samples of water for the bacteriological analyses required by the regulations of the Public Service Commission; which container is described as follows by Mayo Tolman, chief engineer of the board, in the biennial report just issued.

One of the first requisites of such a container is that it shall keep the sample at a low temperature for a considerable length of time. This is particularly true in West Virginia, as distances by railroad are often great, and the State Hygienic Laboratory is unfortunately located off the main line of any railroad, and consequently has poor train service. Unless samples for bacteriological analysis are kept at a low temperature (below 40° F.) the bacteria are apt to develop with the result that the analysis will show a far higher bacterial content than actually is the case. However, size, weight and portability must not be sacrified to the maintaining of low temperature over extended periods of time. It is also essential that a bacteriological sample box shall be strong enough to stand repeated shipment by express. A number of makes were investigated, but they were each deficient in one point or another. The great drawback with the majority was that they were far too clumsy. It was then decided to design a new container along lines similar to that of the bacteriological sample box adopted by the Maryland State Board of Health while Mr. Tolman was in the employ of that body. The construction of the container as finally adopted is shown by the accompanying illustrations.

The boxes are made entirely of galvanized iron and are double walled, the space between the two walls being filled with ⅞ of an inch of nonpareil cork board, which is one of the finest insulating materials known. The inner box is made of No. 27 gauge, galvanized sheet iron, while the outer walls are No. 27 gauge, and the bottom of No. 22. The edges are protected with brass angles that are tightly soldered to the sample box. The bottles, which are "French squares" 50 cubic centimeters in capacity, are held in individual racks soldered to the ice compartment. This compartment, which varies in capacity according to the number of bottles the container is designed to hold, is removable, thus greatly facilitating the handling of the sample bottles and affording a double protection against the water from the melting ice reaching the cork insulating material. The ice can is provided



WEST VIRGINIA FOUR-BOTTLE SAMPLE CASE.

Dimensions, 8¼ x 6¾ x 8¼ inches high. At the left, combined bottle holder and ice compartment removed from case. In the middle, case with lid raised showing bottle holder in place and separate lid used to prevent stoppers of bottles from shaking loose and cover to ice compartment. Also slotted holder for instruction sheet.

with a cover that has a flat spring on its top that presses against the cover of the sample box when closed. A flat strip of galvanized iron with a similar spring on one side has been provided to rest on the stoppers of the sample bottles, thus effectively preventing their becoming loosened during transit. Each container is provided with a brass handle and name plate; the latter stamped with the name and address of the water utility to which it belongs.

While no tests have been made to determine the length of time that the container will maintain the water at a low temperature, samples have been found in a satisfactory condition after 36 hours, if properly iced at the start.

ELECTROLYTIC CELL CHLORINE FOR WATER STERILIZING

Description of Method and Apparatus Employed for Treating the Public Supply of Montreal, Canada—Cost Compared with Hypochlorite.

The Montreal Water and Power Co. treats with chlorine the water delivered by it for public consumption; but in applying the chlorine uses neither hypochlorite nor chlorine gas as is the practice in most plants, but instead obtains the chlorine by use of the electrolytic cell. This plan has been in operation since the first part of this year. It was described in a paper by F. H. Pitcher and James O. Meadows before the American Water Works Association, from which the following description was abstracted.

The process makes use of the well-known fact that salt dissolved in water can be broken down into its elements, sodium and chlorine, by electrolysis. Chlorine gas is liberated at the positive electrode and metallic sodium at the negative. The latter immediately combines with the oxygen in the water, forming caustic soda and liberating hydrogen. The chlorine gas and caustic soda combine to form sodium hypochlorite. This last action is objectionable since the hypochlorite is comparatively weak, the electric current decomposing it after it reaches a certain strength. The chlorine must therefore be prevented from combining with the caustic soda. This is effected in the plant used at Montreal by a diaphram between the positive and negative electrodes.

That plant consists of a salt storage bin of 40 tons capacity, a brine saturating and purifying equipment, two 15 h. p. motor generator sets, four chlorine cells, silver ejectors and distributing lines for applying chlorine water to the water to be treated.

The brine saturating equipment consists of three vertical galvanized iron saturators 27-in. diameter by 6 ft. 6 in. high, provided with a spray system at the bottom and an outlet 6 in. from the top; also two concrete reaction tanks, each with a capacity of 82 cu. ft., with sloping bottoms and provided with a pipe grid for air agitation. Two sand filters are provided for filtering the brine. From these the brine passes to two concrete storage tanks having a capacity of 276 cu. ft. each.

The chlorine gas is ejected into water by means of a silver ejector which maintains a 4-in. vacuum on the chlorine cells. The water so treated with chlorine is lead to the water to be purified by one-inch chemical hose lines.

In preparing the brine, a small quantity of water under pressure is allowed to flow in at the bottom of the saturators, which are charged with salt, and a saturated solution of salt is formed and flows to the reaction tanks. In these, enough soda ash is added to combine with the calcium and magnesium salts in the brine, and the liquid is agitated for half an hour and allowed to stand for an hour to let the precipitate settle. The solution is then filtered through the sand filters into the storage tanks. Just enough hydrochloric acid is added to neutralize the alkalinity and produce an acidity of about .01 per cent, so as to prevent the formation of hypochlorites within the cell.

There are four electrolytic cells of the Allen-Moore type, each a standard 600 amp. unit 7 ft. long by 20⅜ in. wide, provided with Acheson graphite anode plates and pure wrought iron perforated cathode plates. The box is made of concrete protected to withstand the action of acids. Asbestos paper is used for the diaphram. The four cells are connected in series and provided with short circuit switches or cut-outs. The voltage carried on each cell is approximately 3.3 volts, and each cell is capable of producing 32 pounds of chlorine per 24 hours.

Three of the four cells, producing 90 pounds of chlorine gas a day, furnish a sufficient amount for sterilizing the supply at a cost of 7.6 cents per pound. This cost is based on salt at $8 a ton, power at $30 per h. p. year, interest 6 per cent on $5,000, depreciation, 15 per cent, and labor and superintendence $1.37 a day. The cost of using hypochlorite for the same service previous to the installation of the chlorine cells was 13.4 cents per pound of available chlorine, the chloride of lime costing 3.75 cts. per pound (33 1/3 per cent available chlorine), interest on $2,500 at 6 per cent, depreciation at 5 per cent, and labor and superintendence $1.37 a day.

With normal market conditions the annual cost of the two forms of treatment would be approximately the same if no consideration was taken of the general depreciation that chloride of lime causes about a water purification plant.

An electrolytic chlorine cell functions at its best when under a constant current load, and for this reason it is good practice not to vary the load, or if varied to bring about the change gradually. Variations in load cause a considerable deterioration of the diaphragms, with a consequent loss in cell efficiency. For this reason automatic control of the chlorine production from an electrolytic cell is not practical, and for the treatment of a large volume of water without appreciable variations in volume, automatic control is not required, for the dosage can be regulated for the maximum requirements without causing tastes or odors during the minimum consumption periods. The three cells required to supply the chlorine consumed for sterilization are operated with a current load of 500 amperes and 13 volts. The electrolytic cells require very little attention and up to date have given excellent satisfaction.

The chlorine cell installation was adopted because of the saving effected over the present high price of chloride of lime, and inability to secure this chemical with any degree of certainty; and also because common salt is very much easier to handle around a water purification plant, and its use in the chlorine cells does not cause the general deterioration about the works that the use of chloride of lime does. Over-dosage with chlorine does not cause the trouble that chloride of lime over-dosage does, because odors and tastes are not present to the same degree.

The short experience at Montreal with chlorine cells for the sterilization of a public water supply indicates that an installation of this kind is perfectly feasible for large water supplies where the cost of power is not excessive.

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Contributions suitable for this paper, either in the form of special articles or as letters discussing municipal matters, are invited and paid for.

City officials and civic organizations are particularly requested to send Municipal Journal regularly their annual and special reports.

Information Bureau.

Municipal Journal's Information Bureau, developed by twenty-one years' research and practical experience in its special field, is at the command of our subscribers at all times and without charge.

PLUMBING AS A SCIENCE.

It is not so many decades since the planning and constructing of sewerage systems, and everything which had to do with the subject, were considered to be matters of minor importance and were determined entirely by plumbers or others who had practically no scientific knowledge. This has been entirely changed and technical men with as high standing as any in the engineering profession now make a specialty of this class of work.

This applies to the public sewerage system, including both the lines of pipes as they are laid in the street and the disposal of the sewage so collected; but that portion of the system beginning with the street and ending with the house plumbing has not yet been made a serious study by any considerable number of engineers or other scientifically educated specialists. And yet the total amount spent in the construction of these terminals of the sewerage system and their importance to the citizens who use the system are as great as those of the publicly owned pipes and appurtenances. It is true that improper designing or construction of the sewer connection and plumbing that serves any one house is of little importance to the occupants of any of the other houses of the city; but the effect upon the occupants of the house in question is fully as great as would be a defect in the general sewerage system. It follows that general defects found in the plumbing of all the houses in a city are as serious a matter as those existing in the public portion of the sewerage system.

It seems to be high time, therefore, that technically trained engineers should give more attention to house plumbing and sewer connections, with a view to perfecting methods in respect to these and embodying their views in such ordinances, regulations and licensing of plumbers as will secure the best designs and highest grade of workmanship.

Such an improvement in plumbing methods is apparently foreshadowed by the recent awarding of prizes for essays on plumbing, which prizes were awarded by professors of sanitary engineering in Harvard University and in the Massachusetts Institute of Technology, the writers of two of the essays receiving prizes having been a student and an instructor, respectively, in technical colleges. As this was required by the donor, it is apparently his aim to bring about in these schools a greater interest in this branch of sanitary engineering.

SANITATION IN THE CANTONMENTS.

The United States is extremely fortunate in having the experience of England and France from which to draw in preparing itself for war, and apparently the officials are sufficiently wise to take advantage of this experience. This is the case with reference to the sanitation of its cantonments. As stated several months ago in Municipal Journal, the English acted on the belief that the war would be of comparatively short duration and the camps in England at which the recruits were assembled and trained were built with the idea that they would be occupied but a brief time. One result of this was that practically no attention was paid to the sewering of the camps and to the disposal of other waste matters, with the result that in a very few months the conditions became more or less serious and immediate and radical steps were required to put the camps into a condition of sanitation and safety.

Quite the reverse is the case with the United States cantonments now under construction, details of which are described elsewhere in this issue. The water supply and sewerage of each of these cantonments is studied by sanitary specialists such as Allen Hazen, Frank A. Barbour, R. W. Pratt, Geo. W. Fuller, Leonard Metcalf and other well-known engineers, and as many precautions are being taken to secure a safe water supply and to dispose of the sewage in such a way as to entirely eliminate all dangers or nuisances therefrom as would be the case with a permanent city of the highest type. In most cases the water is obtained by wells driven especially for the purpose; while vitrified pipe sewers are laid throughout the camp and the sewage is treated by septic tanks, sprinkling filters, intermittent filters or other of the most modern sewage treatment methods, or else discharged at a distance from the camp into flowing streams where this is possible without creating a nuisance.

As to the details of the camp, one illustration of the care being taken of the health of the recruits is the fact that the sanitary advisers objected strongly to double-deck bunks and their advice is to be followed, and only regulation iron cots will be employed.

Also, in most cases, and possibly in all, the camp site has been chosen with a view to natural drainage, many of them having sandy or gravelly soil into which the rain water will soak quickly, and this also will, of course, be of great assistance in maintaining the men in good, healthy condition. With the reputation which our army officers have already made for improving the sanitary conditions of camps and cities in Cuba and Panama, there can be no question that the camps will be maintained in the most sanitary conditions possible, and there is every reason to believe that the men will really be maintained in a better physical condition than they would have been in their own homes.

STATE FEDERATIONS OF TECHNICAL SOCIETIES.

The following letter, a copy of which has been sent us by Mr. Hazlehurst, would seem to be of general interest to members of engineering societies, and is published in order that the suggestions made therein may be considered by them:

July 6, 1917.

Mr. Frederick H. Newell, Member,
Engineering Council,
Professor Civil Engineering, University of Illinois,
Urbana, Ill.

My dear Mr. Newell:

From recent technical press news, I have noted with great pleasure the organization of an Engineering Council, representing at present the four great Engineering Societies. I am also much pleased to know that you have been appointed a member of this Council from the Society of Civil Engineers. I feel sure that this is a step in the right direction, and along lines which you and some of the rest of us have been advocating so strongly.

Personally, however, I do not feel that it goes far enough, and believe the five societies, representing the strongest engineering elements in the United States, should be organized into state groups along the lines which we have adopted here. At this time we have a Georgia federation of technical societies, consisting of the following members on the Executive Committee: A. J. Schoen, chairman, Am. Inst. of Elec. Engineers; Gabriel R. Solomon, M. Am. Soc. of C. E.; Oscar Elsas, M. Am. Soc. of M. E.; G. W. McCallie, M. Am. Inst. of Mining Engineers; F. M. Smallie, M. Am. Chemical Society.

Within the City of Atlanta proper, there is the Affiliated Technical Societies of the City of Atlanta. The societies represented in this lesser organization are as follows:

American Society of Civil Engineering, American Society of Mechanical Engineers, American Institute of Architects, American Institute of Electrical Engineers, American Chemical Society, Engineers' Association of the South.

Each of these societies supply two members of the Executive Committee, and of which the writer at this time happens to be chairman.

Enclosed herewith you will find a booklet giving the by-laws of this local organization.

Since the affiliation of these local organizations, July 15, 1913, much has been accomplished for the public good and for the promotion of the societies' welfare and individual interest. Amongst the things that have been accomplished has been the incorporation into a State Highway Commission law of three technical members, viz., the Dean of the Engineering School of the University of Georgia, the Professor of Highway Engineering of the Georgia School of Technology and the State Geologist. In the City of Atlanta a Board of Consulting Engineers has been created and appointed by the Mayor, representing the American Society of Civil Engineers, American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Institute of Architects. The writer has also the honor to act as chairman of this Board of Consulting Engineers for the City of Atlanta, and the board's advice and opinions have already been of considerable weight in moulding legislation along technical lines.

For instance, the board has just completed its report on the necessities and requirements of Atlanta Water Department, which contemplates very important additions to the pumping station equipment, the filtration works, the river intake, etc., the expense involving an estimated cost approximating three-quarters of a million dollars.

It would seem to the writer that it is along these lines where we can best hope to succeed in bringing the membership of the technical societies to the front in matters of local importance, especially, and in rendering to the community high service along technical lines.

In order to create and perfect such an organization, it is undoubtedly essential that there should be a field secretary employed by the parent societies, and this letter is by way of suggestion and in the hope that as a member of the Engineering Council you will approve of the plan as above outlined and will use your influence in the council to bring this about.

Perhaps it might be of interest for you to know that the executive members of the Georgia Federation are those appointed by the Naval Consulting Board as associate members, and it would be along the line of easy accomplishment to request that members who have been serving on the Naval Advisory Board in other states continue their good work as executive members of state federations.

Thanking you in advance for your assistance along these lines, which seem to the writer to be entirely practical, and have at least shown good results in this state, I am,

Cordially yours,

JAMES NISBET HAZLEHURST.

ELECTRIC REFUSE COLLECTION TRUCKS.

Dover, England, uses electric trucks for refuse collection with good results. Some of these vehicles have been in service nearly two years and operating costs are available for a period covering the first fifteen months. These data, which were published in a recent number of the London Electric Vehicle, show a considerable reduction in cost over the use of horse-drawn vehicles.

Five 2.5-ton trucks are employed, and these in the 15 months have dealt with 12,741 tons of house refuse—at the rate of 849 tons per month. In addition, the vehicles have done other work for which revenue was directly earned, such as conveying ashes from the docks and general carting for other departments. The comparatively small amount of such revenue-earning work done was due to the increased amount of house refuse that had to be dealt with—an average of 45 tons extra per week over the amounts the previous year. In the days of horse haulage this would have necessitated the employment of five additional horses and carts at an extra cost of $4,550 per year—an expense which the use of the "electrics" has saved.

It should be noted that not all the vehicles have been in use the full 15 months, the last delivered having been at work only seven months.

The expenses connected with operating the five electric vans for the 15 months are as detailed below:

Total mileage, 28,825.
Total annual mileage, 23,000.
Total quantity of refuse collected, 12,741 tons.

Table of Operative Costs of Electric Vehicles at Dover for Fifteen Months.

	Totals.	Percentage of Total Cost.	Cost per Mile (Cents).
Actual wages paid.....	$5,885.16	48.20	20.42
Proportion of foreman's wages	186.62	1.60	0.65
Wages of man at tip.....	243.60	2.02	....
Rents of two tips.....	302.00	2.50	....
Repairs and maintenance...	581.24	4.75	2.02
Stores and sundries.....	63.68	0.55	0.22
Tires	336.24	2.60	1.17
Capital charges on vehicles (capital cost of each vehicle, $5,630)	3,032.40	24.85	10.52
Electrical energy at 3c. per KWH.	1,396.14	11.43	4.84
Insurance	180.00	1.50	0.62
Totals	$12,207.46	100.00	40.46

*Capital charges reckoned upon five vehicles in use from seven to fifteen months.

Thus the total cost per ton of refuse collected was $0.919, which contrasts most strikingly with the previous cost of collection by horses and carts $1.48 per ton. The total cost per mile, excluding wages and capital charges, was $0.085.

FIRE CHIEFS WANTED FOR FRANCE.

The Government wants at once for service in France a fire chief and assistant fire chief (salaries: $1,500 and $1,200, with quarters and subsistence) who can speak French and who are capable of organizing a fire department in connection with warehouses containing military stores. The salary cannot be considered as any indication of the grade of men wanted. Personal character must be above the average. A chance for patriotic service. Address Franklin H. Wentworth, Secretary National Fire Protection Association, 87 Milk street, Boston, Mass.

The WEEK'S NEWS

State Highway Progress in Iowa, Texas and Kansas—Motor Vehicles in the United States—The Army's Sanitary Corps —The Passaic Valley Sewer—San Francisco's Hetch-Hetchy Development—Opposition to Meters in New York City—Competition Rates for Municipal Light Plants in Ohio—New Jersey Cities Fight Gas Standard Reduction—Merit System in Houston Police Force—New York City's Public Service Commission Ten Years Old—Auto Traffic Regulation in New York City and State—Portland, Ore., Develops Its Port Facilities—Tree Planting in Baltimore.

ROADS AND PAVEMENTS

Road Scales Used in Traffic Survey.

Ames, Ia.—It is claimed that for the first time in any state, a "complete" survey of road traffic in Iowa has been undertaken by the engineering experiment station at Ames and the state highway commission. The survey, which will show type, amount and weight of traffic, will be valuable in connection with the use of the federal aid road appropriation to the state, in determining the necessary type of surfacing for different roads and fairest road tax apportionment for different counties. The first survey has just been completed on the Ames-Des Moines road near Ames, when, for a ten-day period, accurate count was kept by means of a novel set of road scales, of all traffic passing on the road. During the period, traffic weighing 4,919,456 pounds passed on this road, carried by 1,995 vehicles, hauling 5,561 passengers. The type of traffic was as follows: 1,394 touring cars, 213 roadsters, 59 motorcycles, 41 bicycles, 44 motor trucks, 1 tractor, 172 horse passenger vehicles, 61 horse freight vehicles, 2 saddle horses, 1 planter and 3 hayracks. The present, it is observed, is not a heavy season for rural traffic. Of the 1,995 vehicles, 647 represented farm traffic, 1,227 interurban and 121 tourist. On Sunday, June 24, alone, more than 1,000,000 pounds of traffic passed the road. The scales have been shipped to Sioux City where the next survey will be made. Roads in Woodbury, Webster, Delaware and Johnson Counties will probably be surveyed by October 1.

To Test Texas Road Law Constitutionality.

Austin, Tex.—An attack on the constitutionality of the law creating the state highway commission is to be made, according to R. B. Humphrey, an attorney of Austin, and a former member of the legislature. Mr. Humphrey said that he has been retained by certain persons, presumably automobile owners, of Austin to make a test case of the act to determine its constitutionality. He insists that the act is discriminatory in that it taxes a special class, that is, the owners of motor cars, while the owners of horses and buggies escape taxation. He also contends that the registration fee is a tax and is not authorized under the constitution. Meanwhile, the state highway commission has divided the state into six districts planned by state highway engineer Duren. A statement by Curtis Hancock, chairman of the commission, says: "We expect the proprietor of each garage in every locality, every accessory house and others to distribute these application blanks as widely among automobile owners as possible. Heretofore the law for registering automobiles has placed the duty upon the county clerks of the state, for which they have been paid 50 cents for each registration. Now the law imposes this duty of registering cars with the commission by the owner. There is certain information necessary to be furnished on the application blank, and every automobile owner in this state will do well to learn the engine number of his car, his car number, the model and make of his car, its actual horsepower, and the amount of money to be remitted to this department for one-half year to January 1, 1918, in order to obtain his license." At a meeting held in Mineral Wells, the commission officially designated twenty-five routes throughout the state. All of the twenty-five state highways may be improved by both state and federal funds, through county commissioners' courts throughout the sections which they traverse. The twenty-five highways constitute a veritable network of roads radiating from every corner of the state and extending to and through the opposite corners. Although counties may make application for both state and federal aid in building and maintaining good roads, this aid will not be granted without the approval and indorsement of the state highway commission. By designating the twenty-five state highways the commission did not obligate itself to indorse or approve requests for aid only if asked in connection with these highways, but it is expected that counties desiring to improve the sections of these highways by which they are traversed will be given every encouragement. As soon as the state highway commission's revenues begin to come in, work on the Texas roads and highways will begin as prescribed by the act, according to Hancock. Although the law prescribes that 50 per cent of the income of the commission shall be returned to the counties from which it was collected, the commission is empowered in such a manner as to influence the improvement of certain highways which it deems most important to general welfare to have improved, Mr. Hancock said.

Reject 28 Blocks of Pavement.

Jefferson, Ia.—The city of Jefferson and the Ford Paving company will let the court settle the matter of some twenty-eight blocks of asphaltic concrete pavement, which at a special meeting of the council, was rejected as not being up to the standard called for in the contract. The council's action was based on the advice of the city's engineers, Bruce & Standeven, consulting engineers. The top of the pavement is cracked in places very badly and the engineers claim that an inferior sort of asphalt was used, making it too brittle. Mr. Demarest, representing the paving company, stated that he would at once begin action in the district court to have the issue determined.

Convict Road Building Experiment.

Baltimore, Md.—A detail of convicts—eighteen in number—have been taken out of the Maryland penitentiary and put to work on state road maintenance in Baltimore County. This is the first time that prisoners from the penitentiary have been employed on outside work since 1812 or 1814, when they were used in the construction of the Reisterstown pike and on the city docks. Those taken out are all men whose terms have nearly expired, so that chances of attempted escape are reduced to a minimum. Two guards were taken along, and at the end of each day the men will be returned to the prison for safekeeping. If the experiment works well other gangs will be taken out from the penitentiary and the house of correction. The prisoners are reported to be well satisfied with their lot in being taken away from the institution to new surroundings. Each prisoner receives a wage of 50 cents daily for his work for the state, and sufficient food is provided until he is returned to Baltimore at night. The location of the scene of work is being withheld by the board of prison control and the state roads commission, in order to prevent visits by curiosity seekers and to prevent any of the regular road gangs from being mistaken for convicts.

More Than 3,500,000 Motor Cars in United States.

Washington, D. C.—In 1916 there were 1,067,332 more motor cars registered in the United States than in 1915. This was an increase of 43 per cent. The gross total of registered cars, including commercial cars, was 3,512,996;

the number of motor cycles registered was 250,820. The several states collected in registration and license fees, including those of chauffeurs and operators, a total gross revenue of $25,865,369.75. Of this amount 92 per cent or $23,910,811, was applied directly to construction, improvement or maintenance of the public roads in 43 states, according to figures compiled by the office of public roads of the United States Department of Agriculture, in circular 73, "Automibile Registrations, Licenses and Revenues in the United States, 1916." The figures for 1916 correspond very closely with the annual percentage increase of motor-registration of the last three years. This yearly increase has averaged 40 per cent in the number of cars and 50 per cent in revenues. When viewed over a period of years, the increase in motor car registration and gross revenue has been remarkable. In 1906 the total state registrations were approximately 48,000 cars, on account of which the several states collected in fees and licenses a total gross revenue of about $190,000. Only a small part of this was applied to road work. In 1916 the $25,865,369.75 collected formed nearly 9 per cent of the total rural road and bridge revenues of the states. Recent years have shown an increasing tendency to put the spending of the motor car revenues directly in the hands of the state highway departments. Of the total amount applied to road work in 1916, 70 per cent, or $16,411,520, was expended more or less directly under the control or supervision of state highway departments. Only 13 states did not exercise any direct control over the expending of the net automobile revenues.

State Law Requires Bridge Railing.

Topeka, Kans.—The state highway commission has sent notices to the county and township officials that the law passed by the 1917 legislature relating to bridges requires that there be a bridge railing at the sides of every bridge and culvert. Some of the commissioners took this to mean that the railing required would be one which would stand a horse or even a motor car running into it. The attorney general and the highway commission have, however, assured them that the railing is merely to be there so that those who use the public highways may know when they are getting close to a bridge and how close they may drive to the side without a wheel dropping into the ditch. Two posts with a board or pipe connecting them, stretching the entire length of the bridge and all painted white are all that is required. In very few counties are the bridges as wide as the graded roads. In some places the bridges are 12 feet wide and the roads 20 feet. These bridges must all be widened to the width of the graded road, or the road grade reduced and railings must be placed along each side of the bridge. The law requires that the railings be painted white, too. This is to warn people at night and it is also required that the weeds be kept cleaned around all bridges so that the posts can be plainly seen at all times.

SEWERAGE AND SANITATION

New Sanitary Corps for Army.

Washington, D. C.—Secretary of War Baker has approved an order creating a sanitary corps under the medical department of the army which will include various classes of experts in sanitation, bacteriology, sanitary engineering, and men skilled in the supply, transportation, storage, etc., in connection with medical department work. The creation of this corps will make possible taking over intact hospital and ambulance units already organized in France which, under the law, can not be incorporated in the medical corps, to which the law authorizes the appointment only of graduates in medicine. It will also make it possible for the medical corps to make use of other trained men not graduates in medicine. Surgeon general Gorgas pointed out the pressing need of a sanitary corps. The total number of officers in corps may be approximately equal to, but not exceed, 1 for every 1,000 of the total strength of the military forces authorized from time to time pursuant to law. "The officers of corps will be provided by assigning officers of the Medical Reserve Corps thereto, or by the appointment of citizens of the United States who are found under regulations established by the secretary of war to possess special skill in sanitation, in sanitary engineering, in bacteriology or other sciences related to sanitation and preventive medicine, or who possess other knowledge of special advantage to the medical department. There shall be no grade in the sanitary corps above that of major and no officer of the medical corps shall be appointed in the sanitary corps. The number in the several authorized grades of the sanitary corps shall be proportional to the number authorized by law for the corresponding grades of the medical corps."

Appointment of a medical advisory committee, composed of leading sanitarians and public health authorities of the country, to advise the Red Cross in dealing with problems of sanitation and public health arising from war conditions, has been announced by the war council of the American Red Cross. It also was announced that establishment of dispensaries in all important seaports of the Allied countries probably will be one of the first undertakings of the Red Cross in administering the big war fund. The membership of the medical advisory committee includes: Dr. Simon Flexner, director of the Rockefeller Institute, chairman; Dr. John W. Kerr, assistant surgeon general, United States public health service; Dr. Herman M. Biggs, director of the New York state department of health; Dr. William H. Welch, dean of the school of hygiene, Johns Hopkins university; Dr. Frank S. Billings, professor of medicine, University of Chicago; Dr. M. J. Rosenau, professor of preventive medicine, Harvard university; Wickliffe Rose, director of the International Health Board; Dr. Victor C. Vaughan, professor of hygiene, University of Michigan; Dr. Charles V. Chapin, department of health, Providence; Dr. Richard P. Strong, professor of tropical medicine, Harvard university; Dr. Richard M. Pearce, professor of research medicine, University of Pennsylvania; ex-officio members, Colonel Jefferson R. Kean, director general, Department of military relief; Dr. T. W. Richards, assistant director general, department of military relief. Permanent offices for the committee will be opened in Red Cross headquarters here, in charge of Professor Pearce, who will act as secretary. The chief sphere of work of the committee will be in connection with plans of the war council for relief in Europe. A Red Cross commission is now studying conditions in France and other allied countries, and two of the main problems confronting this commission—tuberculosis and the spread of children's diseases in France—will engage the attention of the medical advisory committee.

Progress of Passaic Valley Sewer.

Newark, N. J.—Accepting the bid of Charles S. Haskin, of Boston, for the completion of the outfall pressure tunnel under Jersey City and New York Bay, the Passaic Valley sewerage commissioners awarded him the contract at $1,900,000, thus taking the first steps for the completion of the largest remaining link in the trunk sewer. Haskin's original bid was $2,391,000, which was the lowest of five bids received a few weeks ago. This, however, was nearly $300,000 more than the commission was ready to pay until more funds are available. After conferences with the engineers and contractors, it was agreed not to include certain sections of the work in this contract, including a 1,000-foot section of tunnel and terminal chambers. On the remaining sections the bid of Haskin was still the lowest and the contract accordingly awarded to him. The work called for in this contract is that originally undertaken by the O'Rourke Engineering Construction Company of New York, which obtained the contract for the entire section on a bid of $1,796,000, and abandoned it because of difficulties and disagreement with the commission. The contract with Haskin calls for air pressure work, whereas the O'Rourke contract called for free air work. This change accounts for much of the difference between the two prices. Increased cost of materials accounts for the rest. The Boston contractor has done considerable other work for the commission.

The members of the commission recently made their annual inspection and found work on the system which will serve Newark and Passaic Valley municipalities going for-

ward at a satisfactory rate, despite delays caused by labor shortage and the rise in the cost of materials. The work is more than seventy-five per cent completed, with indications that the system will be ready for use by December 31, 1918. The trip was the first general inspection in six months, and during that period much progress has been made on the $1,000,000 pumping station on the meadows, south of Doremus avenue and west of Avenue R. The building where the sewage will undergo a purifying process is 270 feet long and eighty feet wide, and is rapidry taking shape. Most of the brick work is completed. The tunnel under Newark Bay, extending from the Newark waterfront to the shaft terminal on the Bayonne side, has been completed since the previous inspection, and John F. Shanley, Jr., of Newark, the contractor, is removing his equipment. The great concrete pipes which will be placed at the end of the outfall tunnel in New York Bay have all been completed at Packard's wharf in Bayonne. The main sewer through the Passaic valley, ending at the Newark Bay pumping station, has been completed for some time. This is twenty-one miles in length. From the pumping station to the point of discharge, five miles, work is partly completed. There will be about thirteen miles of branch sewers reaching municipalities in the Passaic valley, making the entire system, when completed, about thirty-nine miles in length. The pumping station will have a capacity of 300,000,000 gallons a day, but is expected to handle only 120,000,000 at the outset. Four centrifugal pumps are to be installed, three for use at the beginning and one to meet demands as they increase. The pumping pits are fifty feet deep, and the pump casings are to be twenty-three feet in diameter. A battery of nine boilers, each 250 horsepower, is now being installed. The tunnel under Newark Bay, recently completed at a cost of $1,466,000, is at a depth of 250 feet, rising 170 feet on the Bayonne side and then proceeding at a depth of eighty feet. It was decided cheaper and safer to go down 250 feet and drill through solid rock than attempt to construct a tunnel nearer the surface. Evidence of the increase in the cost of supplies is shown by the fact that steel rails, for which the contractor, John F. Shanley, Jr., paid $18 a ton two years ago, have been sold for $70 a ton. A dynamo which he bought second hand two years ago was sold for twice what a new one would have cost when he bought this one. The price he received for rails is above the present market price, because he is delivering them at once. Steel rails bought now in the regular market are not likely to be delivered for two years. The latest estimate places the cost of the system at $13,500,000. The estimate when the work was undertaken five years ago, was $11,250,000.

Typhoid Epidemic in Village.

Bath, Mich.—This village, located in Clinton county, has been the subject of attention of the state health authorities, especially the engineering department of the state board of health. In the month of June there were 37 cases of typhoid. The total population is but 300. State sanitary engineer Rich sent experts from Lansing to work trying to locate the source of infection.

Ohio State Health Board Reorganized.

Columbus, O.—The state board of health, consisting of seven members, created 31 years ago, passed out of existence when the new law creating a state department of health became effective. Hereafter health affairs will be controlled by a public health council of five members. The governor appoints four and they select a state commissioner of health, who is the fifth member. He is also the chief executive officer, taking over all the administrative duties of the old board and its secretary. He must be a physician, skilled in sanitary science and must give his full time services. He will receive $5,000 a year. The other members get $10 a day when in conference. Because the old board could not get along harmoniously, the legislature decided to abolish the board and create a new department. The old board was without secretary for more than a year because of a deadlock. The commissioner of health is authorized to pass upon propositions coming before the department for approval without holding them up to await monthly meetings as heretofore. From a one-man institution, 31 years ago, the health department has developed into a branch of the state government with eight divisions and 65 employes. The appropriations have increased from $5,000 to $128,000. The present chief executive is James E. Bauman, who has practically "grown up" with the department and is expected to be retained as deputy commissioner. He has been at work twenty-five years. The only surviving member of the original board of health is Dr. T. Clark Miller, present health officer of Massillon.

WATER SUPPLY

Progress on Hetch-Hetchy Project.

San Francisco, Cal.—City engineer O'Shaughnessy has returned after a four days' tour of inspection of the Hetch-Hetchy project. He reports that diamond drilling has revealed the fact that Hetch-Hetchy valley was originally a mountain lake which has, for a long period of time, become filled with gravel and detritus. The drilling has been done to show the depth of gravel and loose rock, twenty holes having been made from the main dam site to a point about 134 feet upstream. The deposit at the dam site is seventy-four feet deep, while at the upstream point, it is 150 feet deep. Drilling was stopped at bed rock. O'Shaughnessy reports work progressing in a very satisfactory manner. Track is laid on the railway project as far as Hamilton's station, a length of thirty-nine miles from Rosasco to the junction with the Sierra Railway of California. About twenty-five miles of track remains to be laid to reach the dam site at Hetch-Hetchy, which should be completed by September 1. Four locomotives are employed on this feature of the big job. About 125 men are employed by the contractor. The right-of-way for the aqueduct line has been obtained from Early intake on the Tuolumne river to Priest's, and adits have been opened up all along the route at each working point so that the character of the material to be encountered is exposed. Diamond drilling has been done here also, so that prospective bidders may know the character of ground along the right-of-way. In the gorge at South Fork a special branch road had to be made down to the opening of the longest tunnel, which has taken about three months to construct. As the city intends to distribute power to contracors working in adits, a pole to transmit current will have to be erected. The final plans have been developed for the main dam structure and it is expected that the city will soon be in a position to call for bids for the dam and nineteen miles of aqueduct. The board of public works has filed with the clerk of the board of supervisors a request that the right-of-way agreement between the city and the Yosemite Power Company be finally approved. The agreement is made for the construction of the Hetch-Hetchy Transportation Railway over the Golden Rock ditch and the Keystone ditch. The city is required only to maintain concrete culverts over the crossings.

The Meter Controversy in New York City.

New York, N. Y.—The board of aldermen has shelved the ordinance recently requested by commissioner William Williams of the department of Water Supply, Gas and Electricity, proposing to install meters in all apartment houses in the city having passenger elevators. The decision followed very exciting public hearings and the loud protests of some real estate men and tenants were apparently convincing. Commissioner Williams fought hard for the measure. There was widespread fear that the metering plan would be extended to all homes. The reasons of the committee of aldermen were that metering would restrict the free use of water by the poor and thus lead to uncleanliness and disease. It quoted a letter from the late mayor Gaynor written in 1911 which read: "I do not believe in charging for water according to meter for domestic purposes or for use in dwellings and tenements. If heads of houses had to pay for water according to meter they would be uneasy when their wives and children took baths, for such is human nature. The result would be discomfort and uncleanliness. Everyone would hesitate to

take a bath sooner than add to the household expense. This would be particularly so among the poor and people of moderate means. I believe in getting an inexhaustible supply and let everyone use all the water he or she wants for washing and bathing and domestic purposes." The committee added the following point: "Vicious tenants would take advantage of their landlord for any petty and malicious grievance by allowing the water to run continuously, and, incidentally, the supply of water would be wasted." Commissioner Williams, in a letter to the board, points out that poor people do not live in apartment houses with elevators. Following conferences with the Advisory Council of Real Estate Interests, commissioner Williams framed an amendment to meet the objection of wilful waste by tenants. This section says: "Wilful waste of water prohibited—No person shall open, hold open, or fasten open, or damage, or tamper with any piping or water fixtures connected with the municipal water supply, or with the public water supply, within the city of New York, of any private water company, or cause any such piping or water fixture to be opened, or held or fastened open, or damaged, or tampered with, for the purpose of wasting water or interfering with the supply of water to other persons, or of defrauding or injuring the city or any private water company or any person responsible for the payment of water rates or water rents pertaining to the water so wasted. Any person who shall violate any of the provisions of this section shall, upon conviction thereof, be punished by a fine of not more than $25, or by imprisonment for not exceeding thirty days, or by both such fine and imprisonment." In his letter commissioner Williams stated that there are 2,063 apartment houses in the city which would be affected, many of which were at one time fully metered. He points out that the department will need additional revenue following the assumption of carrying charges on the debt for the new Catskill supply and that the proposed metering would bring in about $600,000 a year. The cost of metering is estimated at about $320,000 and the cost of maintenance about $7,000 a year. Cost of meter reading and clerical work would be less than under the present flat rate system which requires elaborate periodic inspection of fixtures and interiors and which is impracticable to devise properly. It is to be the policy of the city to acquire the meters now owned by the property owners, and the city will likewise assume all work of installing, maintaining and renewing meters on the municipal service. This will be done entirely independent of the further extension of the meter system itself. Annual service charges will be then established to apply to the metered premises for the purpose of covering the average cost to the department of installing and maintaining the meters. It is also the purpose of the department to establish minimum charges on metered service for the double purpose of insuring sufficient minimum revenue to the city from premises where consumption is very small, and, on the other hand, for insuring an adequate supply of water for domestic purposes in multiple family houses under the minimum charge.

STREET LIGHTING AND POWER

City Plant May Sell Current Below Cost.

Columbus, O.—The Columbus municipal light plant must establish a uniform schedule of rates which will not discriminate between consumers in the same locality. The plant, however, is not barred from selling light and power below cost. These are the two main features of a recent decision by the Ohio supreme court. The decision is statewide, laying down the same principles to all municipal plants in the state. It is the result of a suit by James M. Butler, Columbus taxpayer, brought March 14, 1913, against mayor Karb, the light plant superintendent here and other city officials to enjoin the light plant from making new contracts for sale of electricity. Butler charged the municipal plant and the city were selling "day load" light and power to private consumers below cost; that the contract rates would not pay the interest on bonds for the plant and that taxpayers at large were therefore called upon to make up the deficit; that the sale of current to private consumers so overloaded the plant that it was being damaged and streets could not be lighted properly; that the city had failed to adopt a uniform rate schedule with the result that some consumers were paying more than others in the same locality which means "discrimination." Council recently passed an ordinance fixing uniform rate schedules for current sales from the plant.

Plant Burns During Sale Negotiations.

Williams, Ariz.—Fire from an unknown cause recently entirely destroyed the electric light and water plant at this place and left the town without lighting facilities except such as could be provided by the small private plant of a lumber company. Mayor Reid telephoned to F. A. Jones, chairman of the state corporation commission. The state corporation commission had been making an inventory of the Williams electric light and water plant to ascertain its physical value. This was started two months ago at the instance of the city of Williams which had complained of the service and was with a view of bonding the city to purchase the plant from the Chicago owners. An agreement had practically been reached as to the price at which the plant would be transferred.

Cities Unite to Fight Lower Gas Standards.

Trenton, N. J.—The League of New Jersey Municipalities and a number of individual cities have joined forces to oppose the proposed reduction of the required heating standard of gas from 600-550 B. t. u. to 550-525 units. The cities won a preliminary skirmish when the board of public utility commissioners postponed continuation of hearings until July 16 so that the cities could examine the testimony and get expert advice. Spaulding Frazer acted as counsel for Newark and Judge Francis Scott for Paterson. The Public Service Gas Company and about a score of independent companies fought the delay. Theodore Grayson, represented twelve of the smaller companies, contended that the heating standards exacted by the board is considerably higher than standards required of utility companies in neighboring states. Under the rule of the New Jersey commission, he said, companies must maintain a monthly average total heating value of not less than 600 British thermal units, with a minimum at no time falling below 550 thermal units. Instead of this prevailing standard, Mr. Grayson submitted, the maximum should be fixed at 550 thermal units and the minimum at 525 units. In submitting the case for the Public Service Gas Company, L. D. H. Gilmour said that as a result of the testimony the board might conclude that the rate should be increased and the heating standards lowered as well. He predicted that in the near future it will be necessary to use the lower grade coal which, he submitted, will not produce the standards required by the board. By-products used in the manufacture of gas, Mr. Gilmour contended, are in great demand by the United States Government because of the war. This, he said, will greatly increase the cost.

The first witness to be called by Mr. Gilmour was president Albert E. Forstall of the American Gas Institute. Mr. Forstall said the standard in operation was not fixed as the result of any investigation and expressed the belief that the difference between 600 and 500 British thermal units is not material from the viewpoint of the consumer. He said the standard maintained now is not advantageous to the consumer. John J. Kemp of Philadelphia, an engineer of the United Gas Improvement Company of that city, witness for the company, expressed the belief that consumers would benefit ultimately by a reduction of the present heating standards which would minimize the effect of carbohydrates on mantles, which are generally in use. He thought a lower heating unit would reduce the freezing up of pipes and consequently result in less cause for complaint. R. F. Pierce, engineer of the Welsbach Company of Massachusetts, testified that air adjustments on mantles are not required when the heating standard is below 550 British thermal units, but that much air is needed to burn soluble hydro-carbons, which are present when the heating standard is increased. That the normal cost of production of gas has not existed since 1915 was the substance of testimony given by Carl Geist, manager of the Atlantic City Gas Company. Mr. Geist

said the increase in cost of material for 1916 over the previous year was almost six cents a 1,000 cubic feet. If present market prices continue, he said, this cost will increase to fifteen cents. The cost of coal used by this company, he said, had shown an increase of $5,000 for bituminous and $7,000 for anthracite for the year. If permitted to maintain a lower heating standard than that prescribed now, Mr. Geist said his company could save approximately $10,250. George L. Record organized the cities for the fight, and warned that they would lose all they gained in the famous 90-cent fight, which he also conducted. He said: "If the gas companies are allowed to lower their standard, they would be able to eliminate from the gas certain valuable chemical elements which would be available for the manufacture of explosives in making munitions as a by-product. It will result in supplying gas to consumers of a quality so much inferior to that now supplied as will require the consumption of additional gas in order to obtain the present results, of from ten to twenty-five per cent. The cost of making this gas will be at least ten per cent. less than the cost of the present quality. As the gross receipts of the gas companies of the state aggregate some twelve million dollars, this means a minimum additional exaction from our people of over one million dollars, and possibly twice that amount, and an equivalent saving to the companies." A reduction of fifty heating units, as called for in the pending application, it is estimated, would mean an addition of 8.3 per cent. to the existing bills for all gas used for cooking, for water heating and for power purposes. Gas for the purposes mentioned would therefore cost under the proposed plan, in territory served by the Public Service, about ninety-seven and a half cents per thousand cubic feet, as against the present ninety-cent rate, thus nearly wiping out all that was gained by the long contest in the Passaic gas rate fight.

FIRE AND POLICE

No Fire Protection Outside City Limits.

San Antonio, Tex.—Financial assistance from the board of county commissioners toward establishing fire protection for residents of additions lying beyond the corporate limits of San Antonio will not be forthcoming, because funds for this purpose are not available. This means, in all probability, that property owners of a score of additions lying outside of the city limits will be compelled to provide individual protection against fire. Announcement by mayor Bell that the fire department would cease to respond to alarms of fire beyond the city limits, has caused much concern among property owners in the various additions. Acting chief Goetz announced that instructions given the department provide for runs beyond the city limits only in a few instances, these including a fire at several institutions situated beyond the limits, where loss of life might result by reason of a fire. Investigation shows that some additions of the city, previously announced as lying beyond the city limits, are within the boundaries and therefore will be given protection against fire by the city department. These include Palm Heights, West End, Keystone Park, College Heights, Grand View, Sunny Slope, Three's Addition and Edgewood. Additions affected by the order include Alamo Heights, Los Angeles Heights, Montclair, Madeleine Terrace, Washington Heights and Harlandale, Crestholme and Graves End. The extreme ends of Sunset Place, City View addition and Lakeview will also be affected.

Merit System for Houston Policemen.

Houston, Tex.—The members of the police force of the city are to be marked according to a detailed and rigorous merit system on their general efficiency and conduct. If they fall below 65 they will have charges made against them before the civil service commission for inefficiency. The monthly record of each man will be kept. If his percentage is between 86 and 100, he will be marked "excellent, with a special letter of commendation to the commission;" 84 to 85 is excellent; 82 to 83 is good; 80 to 81 is fair; 78 to 79 is moderate; 75 to 77 is rather poor; 70 to 74 is poor; 65 to 69 is very poor, and below 65 means charges before the civil service commission. Five demerits will take 1 per cent. off a policeman's general standing. All the policemen will first be given a standing by their commanding officer. They will be rated at about what he considers has been their past efficiency as officers. Then it will be up to them to raise or lower that standard. For instance, if a policeman is sick and doesn't report within two hours after his time to go on duty, it will get him 10 demerits, or cost him 2 per cent. in his monthly average. If he is on sick leave for 15 days it costs him two demerits, and three demerits for each day after that for the month. For each day he is off on his vacation he will get one demerit, and when absent with leave two for each day for the first two days and three for each day thereafter. So if a policeman wants his vacation without working an injury to his record he has got to have a high standing for himself. Merits will be given for especially good service, like stopping a runaway, preventing crime, making a "good catch," turning in a reward to the sick benefit fund and many other things. A very detailed system of merits and demerits is being worked out, so that every official act of a policeman will entitle him to either credit or discredit on his standing. However, it is announced no merits will be given for perfect attendance, because that is expected of a policeman while he draws pay. The fact, however, that he can always be depended on to be on the job will be considered by his commanding officer in rating him as 80 per cent. efficient, or 85 or 100 per cent. efficient, whatever it is. For violations of police rules, or conduct unbecoming an officer or rudeness to the public very heavy penalties will be imposed.

Firemen Cross Mexican Border.

Juarez, Mexico—An American fire company a few days ago crossed into Mexico and put out a fire which had gotten beyond control. As Juarez has no organized fire department, the mayor appealed to El Paso for help. An automobile hose company responded, being the first fire company to cross the border to Juarez in three years. The loss was estimated at $100,000 gold.

GOVERNMENT AND FINANCE

Ten Year's Work of Public Service Commission.

New York, N. Y.—The Public Service Commission is now ten years old, the law creating it having gone into effect on July 1, 1907. In all save one state of the Union there are today regulative commissions, many of them founded upon the same lines as those of the New York commission, but differing from it in that they have no local rapid transit powers such as are possessed by the Public Service Commission of the First District. Under its rapid transit powers the commission is constructing the great dual system of rapid transit, involving the expenditure of between $350,000,000 and $400,000,000, about half of which is being contributed by the city of New York. Under its regulatory powers generally, and partly as the laws have been changed to broaden its scope, it has exercised jurisdiction over stock and bond issues of corporations, has accomplished reductions in rates charged for gas and electricity, has eliminated many dangerous grade crossings, has improved the installation and equipment of the various companies under its control and has effected a saving of human life by the enforcement of safety precautions and the installation of safety devices. It has handled many thousands of complaints from the patrons of public utilities and has settled a great portion of these really justified to the satisfaction of the complainants.

The construction of the new rapid transit system has been described as the greatest single municipal transportation achievement in America. At the time of the creation of the commission the old subway, then in operation three years, and the elevated lines both in Manhattan and Brooklyn were rapidly becoing congested to an extreme point and early relief was seen to be necessary. The old Board of Rapid Transit Commissioners, predecessors of the Public Service Commission, left office with some new rapid transit work in course of construction, notably the Centre street loop. The commssion took over the uncompleted work, finished it and began the construction of the Fourth Avenue subway, in Brooklyn, and of the Broadway-Lexington Avenue subway, in Manhattan and the Bronx, previous to the signing of the dual contracts.

The Dual System contracts were signed on March 19, 1913, and cover fifty-three miles of new rapid transit railroad to be operated by the Interborough, with a total length of line of 115 miles. Under the contract with the New York Municipal Railway Corporation of Brooklyn, the operating company for the Brooklyn Rapid Transit, there will be in all about thirty-six miles of new railroad to be operated by that company, with a total length of line of ninety-nine miles.

It is expected there will be in operation about eighty-one road miles of new rapid transit lines out of a total of 109 road miles of new lines in the system by the end of 1917. There will have been expended approximately $325,000,000 up to that time.

Including the third-tracking of the elevated lines, the new rapid transit system will add 345 track miles to the existing rapid transit mileage, and will give New York more than 600 miles of such lines—more than is possessed by any other city in the world.

The regulatory work of the commission has covered a broad field. When the commission came into office the surface car lines, particularly of Manhattan and The Bronx, were on the verge of receiverships. The Interborough-Metropolitan investigation led to the lines of that corporation being placed in receivership, and later to their reorganization on new bases. At the time of the receivership breakdowns in service were frequent, accidents were common, and service generally was in a disorganized and chaotic condition. Today the number of street car accidents has been greatly reduced, due largely to safety equipment installed pursuant to orders by the commission. One important feature of the commission's work has been its oversight of the capitalization of light, heat, power and transportation companies. The applications for approval of proposed issues in 1917 amounted to $836,358,157, of which the commission permitted the issue of $651,967,477. A material reduction in rates for gas and electricity has been effected. At the creation of the commission the maximum rate of the New York Edison Company was 10 cents a kilowatt hour for electricity. By successive reductions this rate has dropped to 7 cents, which recently went into effect. The maximum rate of the Edison Company of Brooklyn in 1907 was 12 cents, which has been reduced to 8 cents.

Valuation of City Property.

Springfield, Mass.—An accurate census of city property and valuations is now available for the first time in over four years, the city realty committee having reported to the city council. This shows that the land and buildings owned by the city are valued at $13,292,846.81. In past years the city realty committee has made a rather perfunctory report of little value. Chairman Nelson W. Haskell of this year's committee decided that a thorough report should be made. Serving with him on the committee are alderman Lester, councilmen Beth, Doyle and Smith. Valuations will be shown in the statement as follows:

Water department land and buildings $206,560.14. On the Little River system the land and buildings are worth, according to assessed valuations in the towns where located, $56,100.67; the Ludlow system, $23,259.47; and in the city of Springfield, $127,200. Under the city property committee's control are buildings valued at $3,547,300.99 and land worth $1,346,492.68. The estimated valuation of the Municipal Group and land is $3,300,000. The police department land and buildings, including that in Indian Orchard, are valued at $179,500. The estimate for the street and engineering department shows land and salable land worth $280,543, and buildings worth $118,700, a total of $399,243. The salable land is strips here and there throughout the city acquired by the city, but not used, in street improvements. The charities department shows the land and buildings on the almshouse site worth $196,300.

The health department owns on State street a tract of land valued at $11,000, and on West street, the so-called West street dump and a part of the land now used as the league baseball park. The value of the last named land is $30,000, making this department's total land value $41,000. Land owned by the park department throughout the city is worth $3,521,500, and buildings, $69,950. This gives the department a total of $3,591,450. The fire department's land is worth $75,800, and the buildings are valued at $409,200, a total for both of $485,000.

Municipal Utilities Profits in English City.

Huddersfield, England.—The Huddersfield council's revenue statements for the past fiscal year show an income from the waterworks of £100,340 ($488,304) and expenditures, including interest on construction bonds, of £98,775 ($480,688), leaving a surplus of £1,565 ($7,616). The receipts of the municipal gas plant were £147,205 ($716,373) and expenditures £139,215 ($677,489), a surplus of £7,990 ($38,884). Improvements to be made soon include a dining hall to accommodate the large number of female employees. The tramway system yielded a revenue for the year of £152,436 ($741,829) and the operating expenses were £90,749 ($441,630). The number of miles run was 2,829,545; the income about 25 cents per car-mile, and the expenses nearly 15 cents per car-mile. This system serves about 160,000 people, and 2,000,000 more passengers were carried than in the previous year.

TRAFFIC AND TRANSPORTATION

City Must Share Grade Crossing Elimination Costs.

San Jose, Cal.—Practically the last obstacle toward the construction of the proposed viaduct railroad crossing over the Alameda, and, in connection, the building of the new West San Jose depot, was removed when the supreme court of California upheld the power of the state railroad commission to require a city to bear part of the cost of making a separation of grades at a railroad crossing. In the decision written by justice Harry Melvin, attention was called to the fact that San Jose voted to the railroad commission the city's powers of regulating public utilities. For this reason the court held that the provisions of the public utilities act empowering the railroad commission to direct the separation of grades at railroad crossings, and to divide the cost between the railroad and the city, were applicable within San Jose. As a result of the controversy between the city of San Jose and the company respecting the matter of paying for the required grade at the crossings in the vicinity of the West San Jose depot, the council at that time decided to leave the matter entirely with state railroad commission, which decided in accordance with the findings of the supreme court. City Attorney Lamb said that the commission ruled that the city would be required to pay 35 per cent of the cost of separation of grades, the county 15 per cent and the Southern Pacific the remainder. The separation of grades on the Alameda will cost about $350,000. City manager Reed said that San Jose contended that the commission had no jurisdiction toward compelling a city to pay for the improvements of any railroad, and hinted that the matter might be further contested.

Uniform Traffic Regulations for State.

Albany, N. Y.—Traffic regulations throughout the state are made uniform for the first time by governor Whitman's recent signing of the Welsh traffic act. The Welsh bill was drawn up by the conference of mayors and other city officials of the state. It was amended many times during its travels through the legislature, but in its present form it regulates traffic of all vehicles and street surface cars. It prescribes definitely the right of pedestrians and vehicles and contains provisions for the safety of various vehicular traffic and for the suppression of unnecessary noise. Local authorities are given power only to make and enforce ordinances and regulations regarding traffic that special local conditions may make necessary. Some of the more important prohibitions are:

No vehicle and no street surface car shall be driven through a procession, except with the permission or by order of a police officer. If the procession takes more than five minutes to pass it shall be broken and traffic allowed to go through.

Driving within a safety zone is prohibited.

No vehicle shall emerge from an alley, stable, garage or driveway except slowly and under control of the driver who shall give a proper warning by voice or signalling device to passing vehicles and pedestrians.

Use of muffler cut-out on any highway within the limits of the city or incorporated village is barred.

Gong and siren whistles shall not be used on any vehicle other than ambulances and vehicles operated by a police department, fire department, sheriff, authorized public utility company when on emergency calls and the United States mail and military services.

Except in an emergency or when advised to do so by a police officer, no vehicle shall be stopped or left standing within the intersection of any cross street; within 10 feet of any crosswalk or street crossing or alley corner, except where traffic officers are on duty; within 10 feet of any fire hydrant unless the vehicle is actually in charge of some person capable of driving it; in such position as to prevent another vehicle already stopped near the curb from moving away; in front of or within 15 feet of either side of the entrance to any theater, auditorium, or other building where large assemblages of persons are being held, except to take on or discharge passengers or freight and then only for such length of time as is necessary for such purpose; in any portion of any street where street surface cars stop to receive or discharge passengers, except as otherwise provided.

No vehicle shall be stopped in any street close to the curb thereof, unless in case of emergency or to allow another vehicle, street surface car or pedestrian to cross its path. This regulation shall not be construed to prevent local officials designating portions of streets as parking spaces.

No vehicle may stop with its left side to the curb except in one-way streets.

A vehicle when loaded with any material extending at least four feet beyond its rear shall be provided with a red flag by day on the extreme end of such load.

It is unlawful to make any except absolutely necessary repairs in any street or public place.

A vehicle, unless confined to tracks, shall not tow more than one other vehicle, and the connection between the two shall not be longer than 16 feet. Each towed vehicle must have an attendant.

Street cars shall have the right of way over other vehicles at cross streets.

The driver of any vehicle proceeding upon the tracks in front of a street car shall turn out as soon as possible upon signal of the operator of the car.

No person shall drive or ride a motor vehicle, motorcycle or bicycle in any street without having a hand on the handle bars of steering device.

The driver of a two-wheeled motorcycle or a bicycle shall not carry any other persons thereon except on a seat securely fastened to the machine in the rear of the driver and provided with foot rests and hand grip.

No person shall coast with handsleds, bobs or carts or other vehicles on wheels or runners on any sidewalk in a city; nor in any street except such streets as may be designated by the common council, board of aldermen or commission of that city.

No motor vehicle shall be operated in such way as to emit unnecessary smoke or offensive vapors.

New York, N. Y.—Every owner of an automobile who drives his car in New York city has been required to take out an operator's license before July 1, according to the provisions of the Cromwell-Kelly bill signed recently by governor Whitman. The Safety First Society of New York, in commenting on the law, said: "Not only is the owner required to have an operator's license, but if his wife, daughter or son drives, she or he must also take out an operator's license. The card issued by the Secretary of State must be carried by the person operating the car." The law had its inception in agitation by the Safety First Society. It provides a quick means of identification for every motor vehicle operator, and confers upon the Secretary of State power to suspend or revoke the license of any operator for the following offenses: "A third or subsequent violation of the speed law. Conviction of a felony. Disability of the holder of a license by reason of intoxication or use of drugs. Gross negligence by the operator as a result of which person or property is injured. Going away without stopping and giving name and address after causing injury to any person or damage to any vehicle. Operating a motor vehicle in a manner showing a reckless disregard for the life or property of others." No examination is required by the law.

MISCELLANEOUS

Comprehensive Port Development for Portland.

Portland, Ore.—The recent voting by a large majority in favor of a $3,000,000 bond issue for a municipal grain elevator and additional dock and warehouse facilities marks a new important stage in the realization of the comprehensive plan for the development of the port of this city. Since the creation of the commission of public docks in 1910, the progressiveness of its members and the skill of its engineers have been responsible for striking improvements to the city's water terminal facilities. When the commission was created by charter amendment, the voters approved an issue of $2,500,000 for the construction of docks and other waterfront utilities. With the expenditure of this money the commission has now in operation three docks, with a total frontage of 2,505 feet, and two warehouses used for storage of a number of commodities. The planning of the new grain elevators followed careful investigation by the commission. Portland has for many years been the chief grain export port for the Pacific Northwest. With the completion of the Panama canal shipping methods are beginning to undergo a radical change. The usual custom of handling grain in transport for export and delivery to California ports has been by sacks. Now the wheat growers of the "Inland Empire" of Oregon, Washington and Idaho have taken steps to eliminate the use of sacks and to ship their wheat from point of production to tidewater in bulk, as is now almost universally the practice. Realizing that the new method will be permanent, the commission asked the voters for the $3,000,000 issue to provide facilities. The necessary plans are now being prepared and construction will be begun as soon as possible so that the port may be able to handle the 1918 grain crop in bulk. The proposed elevator will consist of a first unit of one million bushels, and the head or working house to be sufficiently large and to contain machinery necessary to permit a total capacity of two million bushels storage. The elevator will be of concrete and of strictly fireproof construction. The cost of the elevator itself, including the machinery and storage bins, is estimated to be $900,000.

In the recently published report of the commission for the past year, which is well illustrated with photographs and the latest navigation charts of the port, is given a review of the work and financial operation of the development. The completed improvements are as follows: A motorboat landing, of fireproof construction, with barge float and two waiting or rest rooms and public comfort stations; a second story addition to the landing provides permanent offices for the commission. Dock No. 1, a quay 955 feet long, 300 feet in two levels, covered with a transit shed 935 feet long and 100 feet wide; a slip 120 feet wide and 484 feet deep and an open dock also 484 feet long; a one-story warehouse 190 by 200 feet, and a one-story transit shed 330 by 176 feet. This forms a very compact terminal, adequately served by rail trackage facilities, at which 59 fifty-foot cars can be accommodated at one time, while the frontage and slip afford berthing for one 500-foot vessel and two 450-foot. Dock No. 2 is a two-level quay, 526 feet long, covered with a 100-foot transit shed with accommodations for 16 fifty-foot cars. Dock No. 3 is a quay 540 feet long and 50 feet deep, 100 feet in two levels—with a transit shed 440 feet long. The superstructures of the first and second docks are of heavy mill construction, supported on wooden pile foundations. For the expeditious and economical handling of cargo there have been installed cargo masts and four portable electric dock winches. At the first dock there is a three-ton freight elevator and at the second there are two such elevators. An electric conveyor, two 2-ton electric dock trucks, a twenty-ton locomotive crane and adjustable ramps facilitate freight handling by the most modern methods. A board consisting of the city engineer, the engineer of the commission, the secretary of the Fire Underwriters' Equitable Rating Bureau and the fire marshal has been investigating the proposed construction of fire stops at the waterfront.

The commission exercises jurisdiction over the whole 25 miles of waterfront, passing on all applications for structures and repairs. The expenditures on the ship channel from Portland to the sea have been about $3,950,000 by the United States and $4,250,000 by the Port of Portland. At the mouth of the Columbia River, the entrance depth is now forty feet at low water and the depth is thirty feet along the channel. The operating revenues of the three docks for the last fiscal year were, respectively, $25,624.48 $7,940.53 and $3,721.23, while the operating expenses were $11,927.95, $8,063.55 and $1,284.62. The total revenues, including $171,733.43 in taxes, were $215,870.71, while the surplus was $61,695.12. The commission of public docks consists of C. B. Moores, chairman; Ben Selling, vice-chairman; John H. Burgard, F. C. Knapp and A. H. Averill. The engineer and secretary is G. B. Hegardt, M. Am. Soc. C. E.

Tree Planting in Baltimore.

Baltimore, Md.—The Division of Forestry, under city forester R. B. Maxwell, has completed the planting work for the spring season. Shade trees, totalling 666, were planted on the city's footways, and 5,500 on the Loch Raven watershed. The planting done in the city is a portion of the primary tree planting plan of the division. The following shade trees were planted for property owners upon request, and at the standard charge of $4.00 per tree: oriental planes, 24; Norway maples, 10. To fill failures in all planting made to date 235 trees were required. This includes the failures in more than 5,000 young trees. The planting of abandoned farm lands on the Gunpowder watershed was continued, and the following stock was used: white pines, 35,000; red pines, 10,000; red oaks, 3,500; white ash, 3,500; sugar maples, 3,500—a total of 55,500 altogether. This makes a total of over 400,000 young trees planted on the watershed since the work was started.

THE MUNICIPAL INDEX

In Which Are Listed and Classified by Subjects All Articles Treating of Municipal Topics Which Have Appeared During the Past Month in the Leading Periodicals.

It is our purpose to give in the second issue of each month a list of all articles of any length or importance which have appeared in all the American periodicals and the leading English, French and German ones, dealing more or less directly with municipal matters. The Index is kept up to date, and the month of literature covered each time will be brought up to within two or three days of publication. Our chief object in this is to keep our readers in touch with all the current literature on municipal matters. In furtherance of this we will furnish any of the articles listed in the index for the price named after each article, except that where an article is continued in two or three issues of the paper, the price given is for each of said issues. In addition to the titles where these are not sufficiently descriptive or where the article is of sufficient importance, a brief statement of its contents is added. The length also is given, and the name of the author when it is a contributed article.

ROADS AND PAVEMENTS.

Asphalt:

Concrete-Asphalt Roadways. Increasing weight of traffic is chief factor in destruction of roads. Concrete base necessary for permanent construction. 2 ills. 1,250 words. Municipal Journal. June 28. 10 cts.

Sheet Asphalt on Old Macadam Base. Practice in several cities. 2 ills. 1,000 words. Engineering and Contracting. June 6. 10 cts.

Cost of Operating Municipal Asphalt Plant of District of Columbia. 1,200 words. Engineering and Contracting. June 6. 10 cts.

Assessments:

Fitting Street Assessments to a Hillside Town. Frontage, area, value, benefit or damage and correction for overassessments are factors used. By Leonard Hohl. 2 ills. 750 words. Engineering News-Record. June 14. 15 cts.

Bituminous:

The Maintenance of Bituminous Pavements. Description of special forms of bituminous road construction. Suggestions concerning the repair of bituminous pavements other than asphalt. 8 ills. 5,000 words. Municipal Engineering. June. 25 cts.

Bituminous Macadam Pavements Laid in 1916 and Proposed for 1917. 2½ pages. Municipal Engineering. June. 25 cts.

Bituminous Surfaces. Road oils and tars considered from the standpoint of their use with the maintenance of broken stone and gravel roads. From a paper by A. H. Blanchard. 2,500 words. Engineering and Contracting. June 6. 10 cts.

Brick:

Brick Road Job Furnishes Uncommon Cost Data. Itemized cost kept of the header construction and grout filling. 4 ills. 1,200 words. The Contractor. June 22. 10 cts.

Concrete:

Wear on Concrete Road Surfaces. The third of three articles. Effect of traffic on mortar and on aggregate particles. By C. B. McCullough. 8 ills. 2,000 words. Concrete. June. 20 cts.

Repairing Concrete Pavements. Methods recommended by the Portland Cement Association. 850 words. Municipal Journal. June 7. 10 cts.

Belt Method Employed on 49-foot Concrete Pavement. 2 ills. 200 words. Engineering and Contracting. June 6. 10 cts.

Construction:

Road Work in the Mexican Desert. A striking example of experience in road building and in the handling of road machinery and labor under most adverse conditions. By Capt. J. A. O'Connor, U. S. A. 4 ills. 4,000 words. The Surveyor. June 1. 40 cts.

Track Construction in Des Moines. Entire downtown track layout rebuilt without stopping traffic. Types of construction described. By W. L' Wilson. 9 ills. 1,200 words. Electric Railway Journal. June 2. 10 cts.

Michigan's Trunk Line System. By D. A. Thomas. 1 ill. 2,500 words. Good Roads. June 16. 10 cts.

Road Construction. From a paper by M. A. Lyons. 3,000 words. Western Municipal News. June. 15 cts.

Construction Work in New York State Highway Department in 1916. 1,500 words. Good Roads. June 9. 10 cts.

Street Improvement in Ontario. Department of Highways presents detailed report on paving work in 22 cities and 11 towns. 2 ills. 7 pages. The Canadian Engineer. June 28. 15 cts.

Old Concrete Foundation Furnishes Most of New Base in Street Widening. By Hans Helland, Jr. 3 ills. 400 words. Engineering News-Record. June 21. 15 cts.

Busy Street Repaved Without Stopping Street-Car Traffic. Recut granite block laid between rails and asphalt paving on main roadway. 1,000 words. Engineering News-Record. June 28. 15 cts.

Road Building in Alabama. By J. B. Converse, Asst. State Highway Engr. 6 ills. 2,200 words. Good Roads. June 30. 10 cts.

Convict Labor:

Convict Labor on State Road Work in Va. 4,000 words. Engineering and Contracting. June 6. 10 cts.

Design:

Grades and Alignment of Trunk Roads in Province of Quebec. 1,100 words. Engineering and Contracting. June 6. 10 cts.

Drainage:

Road Drainage. By A. H. Hinkle, Maintenance Engineer, Ohio State Highway Department. 3 ills. 2,000 words. Better Roads and Streets. June. 15 cts.

Earth:

Sand Clay and Top Soil Roads. Should they be built in southern Appalachian regions? Has the past winter proved them to be failures? By Jos. Hyde Pratt. 3 ills. 5,000 words. Southern Good Roads. June. 10 cts.

Foundations:

Bituminous Foundations for Sheet Asphalt surfaces. By L. Kirschbaum, Director, Chicago Paving Laboratory. 4 ills. 2,000 words. Engineering News-Record. June 21. 15 cts.

Gravel:

The Construction of Gravel Roads. From a paper by W. F. Canning, of the Ky. Dept. of Public Roads. 2 ills. 5,000 words. Better Roads and Streets. June. 15 cts.

Granite:

Durax Pavement Construction at Dayton, O. Methods and cost. 1 ill. 1,000 words. Engineering & Contracting. June 6. 10 cts.

Granite Block Pavement. From a paper by Wm. H. Connell. 1,800 words. The Canadian Engineer. June 7. 15 cts.

Legal:

Oklahoma Makes New Laws for Road Improvement. 2,000 words. Good Roads. June 23. 10 cts.

Paving Contracts. From a paper by W. Earl Weller. 2,800 words. Good Roads. June 23. 10 cts.

Amendments to California's Road Laws. 3,000 words. Good Roads. June 23. 10 cts.

South Carolina's Highway Department Law. 1,250 words. Good Roads. June 9. 10 cts.

Recent Highway Legislation in Maine. 2,500 words. Good Roads. June 9. 10 cts.

New and Amended Road Laws of Montana. 3,000 words. Good Roads. June 2. 10 cts.

Maintenance:

Earth and Gravel Road Maintenance. By A. McGillivray. 3,000 words. Western Municipal News. June. 15 cts.

Staffordshire Main Roads. Maintenance and patching work. Construction. By James Moncur, Co. Surveyor. 1,800 words. The Surveyor. May 25. 40 cts.

Oiling:

Surface Tarring in Hampshire. By W. J. Taylor, Co. Surveyor. 1,000 words. The Surveyor. June 1. 40 cts.

Miscellaneous:

Cost of Cobble Lined Gutter in Los Angeles County, California. 2 ills. 800 words. Engineering and Contracting. June 6. 10 cts.

Curb and Pavement Made Monolithic. Money saved and satisfaction given by integral curb. 5 ills. 1,000 words. Concrete. June. 20 cts.

Many Road Improvements in Yellowstone National Park. What the government has done to make the park accessible to motorists. 3 ills. 1,500 words. Southern Good Roads. June. 10 cts.

Road Building Records. Classification and record of layout and construction costs of highway work for the state road commission of Maryland. 1,250 words. Contracting. June. 20 cts.

Township Road Superintendents' Daily Report Sheet. 3 ills. 500 words. Better Roads and Streets. June. 15 cts.

Bond Issues as a Source of Revenue for Highway Improvement. 6 ills. 7,000 words. Better Roads and Streets. June. 15 cts.

The Importance of the Cheaper Types of Roads. 4 ills. 2,000 words. Good Roads. June 9. 10 cts.

Japanese Roads and Highway Bridges. Roads are generally narrow and not very smooth. By J. L. Harrison. 10 ills. 2,000 words. Engineering and Contracting. June 6. 10 cts.

Labor and Material Report Forms Used by Resident Engineers of Illinois Highway Commission. 2 ills. 800 words. Engineering and Contracting. June 6. 10 cts.

Improved Street System for St. Louis. Plans prepared by City Plan Commission. The principal aim is to provide more adequate facilities for traffic. Street width standards. Legislation necessary. By Andrew Linn Bostwick. 2 ills. 1,800 words. Municipal Journal. June 28. 10 cts.

Road Division Headquarters Re-arranged for Efficiency, Yard and building interior in Los Angeles county road system laid out for convenience and economy. 2 ills. 1,000 words. Engineering News-Record. June 21. 15 cts.

Effect of the War Upon 1917 Road Work. Results of inquiries concerning the effect of the war on road work in the several states. 3,000 words. Good Roads. June 2. 10 cts.

The Effect of the War Upon 1917 Road Work. Report from many of the states on the probable effect of the war on road work. 3,000 words. Good Roads. June 9. 10 cts.

Effect of the War on 1917 Road Work. Reports from State Highway Departments. 1,800 words. Good Roads. June 16. 10 cts.

Resurfacing:

Method of Resurfacing Old Macadam Road. Types of resurfacing. Extraordinary repairs; reconstruction. 1,500 words. Engineering and Contracting. June 6. 10 cts.

Traffic:

Traffic Regulations. From a paper by Henry J. Case. 3,000 words. Good Roads. June 30. 10 cts.

SEWERAGE, DRAINAGE AND SANITATION.

Activated Sludge:

Activated Sludge Experimental Work at Milwaukee. Influence of low temperatures not detrimental. Sludge can be converted into a profitable market fertilizer. Determination of best methods of diffusing air throughout the sewage. 2 ills. 3,500 words. The Canadian Engineer. June 14. 15 cts.

Milwaukee Air-Diffusion Studies in Activated Sludge. Large air-water interface must be exposed. Nozzles and mechanical beaters are eliminated and fine-bubble diffuser plates are most promising. By C. H. Nordell. 4 ills. 1,500 words. Engineering News-Record. June 28. 15 cts.

Recommend 50,000,000-Gallon Activated Sludge Plant. Committee of Chicago sanitary districts advises expanding preliminary plans to include entire district and the immediate construction and six months' trial operation of a 1,500,000-gallon single unit. 2,500 words. Engineering News-Record. June 21. 15 cts.

Concrete:

An All-Concrete Sewerage System. Sewer pipe, manholes and underdrains and sprinkler pipes for filters are all of

concrete. 3 ills. 800 words. The Cement Era. July. 20 cts.

Experience with Concrete Sewers. Facts and opinions of engineers of 32 cities as to relative merits and costs of monolithic concrete, concrete pipe and brick. 1,500 words. Municipal Journal. June 7. 10 cts.

Construction:

Driving a Small, Hard Rock Tunnel in New York. Heading excavated to full size. Concrete mixed by gravity in shafts and delivered in muck cars on single track. Combination arch forms handled by jacking cars. 1,500 words. Contracting. June. 20 cts.

Open Cut Sewer Costs Show Well Balanced Job. Long handle steam shovel makes high yardage in deep trench. 2 ills. 800 words. The Contractor. June 22. 10 cts.

Brick Laying Schedule Speeds Up Small Sewer Construction in Tunnel. 600 words. The Contractor. June 22. 10 cts.

Deep Open Ditch Costs Less Than Sheeted Trench for 30-inch Drain Pipe. Fast work gets pipe laid before soft banks cave in. 3 ills. 600 words. The Contractor. June 22. 10 cts.

Filters:

Photographs for Studying Filters. Ice forming on beds in winter indicates the area covered by spray and intensity of discharge at various points. 6 ills. 1,000 words. Municipal Journal. June 14. 10 cts.

Gas:

Explosive Gas in the West Side Tunnel Before and After the Explosion July 24, 1916. By W. J. German. 13 ills. 18 pages. Journal of the Cleveland Engineering Society. May. 50 cts.

Miscellaneous:

Some Sewerage Details in Calgary. Inlet for taking water on street grades. Catch basins and manholes made of precast concrete sections. Sewer grit chamber. 3 ills. 1,200 words. Municipal Journal. June 7. 10 cts.

New York Adopts Rules for Sewage Works and Outlet Design. Grit chambers, screens, sedimentation tanks, hydraulic grades and outlet locations are covered. 1,000 words. Engineering News-Record. June 21. 15 cts.

Measuring, Locating and Stopping Leaks on Sewer Contract. Pipes bared and aniline dye used to locate leaky joints. Cement-mortar collars applied. By R. B. Ray. 1,000 words. Engineering News-Record. June 21. 15 cts.

Sewering a Small Community. Petersburg, W. Va., constructs sewerage system. Largest pipe is 8-inch, but most is 4 and 6-inch. 1 ill. 750 words. Municipal Journal. June 14. 10 cts.

Imhoff Tank Royalties. War with Germany makes it illegal to pay royalties. 1,000 words. Municipal Journal. June 7. 10 cts.

Sanitation:

Sanitation in British Army Camps. Methods developed during the present war for collecting and destroying all kinds of refuse. 6 ills. 2,000 words. Municipal Journal. June 14. 10 cts. Combustible refuse disposed of by incineration. Obtaining and purifying water. Provisions for bathing. Infectious diseases. 4 ills. 1,500 words. Municipal Journal. June 28. 10 cts.

Military Sanitation. From a paper by Lieut.-Col. W. P. Chamberlain. 3,000 words. Journal of the Boston Society of Civil Engineers. June. 50 cts.

Treatment:

The Treatment of Sewage. Discussion of a paper by Bertram Blount. 2,500 words. The Surveyor. May 25. 40 cts.

Operating Results of Imhoff Tank Sewage Disposal Works at Fitchburg, Mass. 4,000 words. Engineering and Contracting. June 13. 10 cts.

Kitchener Sewage Disposal Works. City will have two complete disposal systems of different types. New 2-story type sedimentation tanks and spraying filters now being constructed at cost of $75,000. By Herbert Johnson. 9 ills. 2,500 words. The Canadian Engineer. June 21. 15 cts.

Rochester's Sewage Disposal Plant in Operation. 4,000 words. Municipal Engineering. June. 25 cts.

Septic Tanks Reconstructed as Imhoff Tanks at Columbus. The second of two articles. Special features of design and construction. New tanks built while half of old plant was kept in service. By J. J. Morgan. 3 ills. 1,500 words. Engineering News-Record. June 7. 15 cts.

WATER SUPPLY.

Connections:

Water Service Connections. Comparison of costs and life of iron and lead connections. From a paper by G. O. House. 1,600 words. Municipal Journal. June 28. 10 cts.

Construction:

Troubles in Constructing a 48-Inch Submerged Main. Cost details of shafts and tunnels. Steel riveted pipe sections each 30 feet long. Description of the plant used for pulling sections into place. From a paper by F. W. Cappelin. 6 ills. 3,500 words. The Canadian Engineer. June 7. 15 cts.

Dams:

Grouting the Foundation of the Elephant Butte Dam. Upstream row of grouted holes and two downstream rows of drainage wells serve as telltales. By E. H. Baldwin. 3 ills. 2,500 words. Engineering News-Record. June 28. 15 cts.

Settlement Observed on Two Earth Dams in Porto Rico. By J. M. Giles. 2 ills. 1,000 words. Engineering News-Record. June 21. 15 cts.

Design:

The Design of a Tower for a 50,000-Gallon Hemispherical Bottom Tank. Stress sheets and notes on designs of columns, rods, bolts, struts and foundations. 3 ills. 1,300 words. The Canadian Engineer. June 14. 15 cts.

Failure of Hydraulic Projects from Lack of Water Prevented by Better Hydrology. More complete study of stream yield is first step. Low-flow frequency, degree of flashiness and dry weather evaporation can not be neglected. By R. E. Horton. 2,500 words. Engineering News-Record. June 7. 15 cts.

New Design of Screen Chamber. Detailed description of screen suitable for use in connection with water supply system. From a paper by John H. Lance. 4 ills. 1,500 words. The Canadian Engineer. June 21. 15 cts.

Reliability of Pumping Station Design From a paper by Clarence Goldsmith. 2,000 words. Fire and Water Engineering. June 13. 10 cts.

Meterage and Waste:

Leakage from Water Mains at Washington. 800 words. Engineering and Contracting. June 13. 10 cts.

Water Metering and Consumption in Springfield. Effect on consumption of 12 years' increase in metering. All private and some public services now metered. 1,750 words. Municipal Journal. June 14. 10 cts.

Miscellaneous:

Montreal Aqueduct Report. Second of two articles. Report says steam plant would have been better than enlargement. 7,000 words. The Canadian Engineer. June 7. 15 cts.

The Treasury Department Standard for Drinking Water, Its Value and Enforcement. By H. P. Letton. 1,000 words. Fire and Water Engineering. June 6. 10 cts.

Flow Through Sharp Edged V-Notches or Weirs. By E. W. Doubler and F. H. Rayfield. 7 ills. 2,500 words. The Cornell Civil Engineer. May. 25 cts.

The Relations of Water Supply to Disease. From a paper by F. L. Parker. 1,500 words. Fire and Water Engineering. May 30. 10 cts.

The Quality of Water and Confirmatory Tests for B. Coli. By Abel Wolman. 1,000 words. Fire and Water Engineering, May 30. 10 cts.

Service Charges—How Constituted. Report of committee of American Water Works Association. 3,000 words. Engineering and Contracting. June 13. 10 cts.

Chlorine Cell Installation of Montreal Water & Power Co. 2,000 words. Engineering and Contracting. June 13. 10 cts.

Cleaning Pipe Coated with Metallic Slime. 350 words. Engineering and Contracting. June 13. 10 cts.

Useful Life of Water Works Units. Data from report of Committee of American Water Works Association in regard to depreciation. 2,000 words. Engineering and Contracting. June 13. 10 cts.

Old Conduit Breaks Alongside Trench for New Conduit. Flow maintained by sand bag channel until new conduit could be constructed. 3 ills. 1,000 words. Engineering News-Record. June 7. 15 cts.

Water Works Property Exempt from Taxation. 1,000 words. Municipal Journal. June 14. 10 cts.

Experiments on Removal of Iron from Water Supply of Springfield, Ill. 8 ills 1,200 words. Enginering and Contracting. June 13. 10 cts.

Laboratories for Small Water Works. 1,000 words. Municipal Journal. June 28. 10 cts.

Operation:

Operating Results of Plant for Removal of Iron and Manganese from Ground Water at Lowell, Mass. 1,750 words. Enginering and Contracting. June 13. 10 cts.

Practical Problems in Filtration Plant Operation and Their Solution. 1,500 words. From a paper by L. I. Birdsall. Engineering and Contracting. June 13 10 cts.

Overcoming Practical Problems in Mechanical Water Filter Operation. From a paper by L. I. Birdsall. 2,000 words. Enginering News-Record. June 14. 15 cts.

Pumping:

Pumping Station Cost and Efficiency Records. From a paper by Mark Wolff. 2,000 words. Fire and Water Engineering. June 20. 10 cts.

Endurance-Efficiency Pump Tests. Data as to endurance and efficiency tests on four motor-driven, centrifugal, high pressure, fire service pumps. The method used to correct the over-registration of the discharge Venturi meter is given. By L. A. Quayle. 6 ills. 2,000 words. Power. June 19. 5 cts.

Pumping in Metropolitan Water District of Massachusetts. From a paper by A. O. Doane. 5,000 words. The Canadian Engineer. June 14. 15 cts.

Duty Trials on Pumping Engines at Toronto. Details of conditions governing the trials and description of units and results. By R. W. Angus. 1 ill. 3,200 words. The Canadian Engineer. June 21. 15 cts.

Reservoirs:

Small Earth Reservoirs as an Adjunct to Electrically Operated Irrigation Pumping Plants. 1,000 words. Engineering and Contracting. June 13. 10 cts.

Trenching:

Trenching by Machine. 6-foot water main laid in trench 8 feet deep. Cost of excavation with machine was less than $1.00 a foot. 1 ill. 1,600 words. Municipal Journal. June 7. 10 cts.

Water Supply:

Recent Progress in Water Supply. Advance made in the past 10 years in improving quality. Improvements in pumping machinery. Consumption and metering. From a paper by John W. Alvord. 4,500 words. Municipal Journal. June 14. 10 cts.

STREET LIGHTING AND POWER.

Cooking:

Some New Aspects of Electric Cooking. Statistics showing the advantages and economies of electric cooking. By T. H. Kettle. 2 ills. 5,000 words. Electrical Review. June 23. 10 cts.

Electric Cooking and Heating. About 50 cities report incomes from this source. 400 words. Municipal Journal. June 21. 10 cts.

Lighting:

Improvements in the Street-Lighting System of Chicago. Flame arcs to be replaced by mazda C series lamps. 4 ills. 1,200 words. Electrical Review. June 9. 10 cts.

Utilization Factors for Street Lighting Units. Method of calculating flux incident upon street surfaces from the zonal candle powers of the lighting units. By Eugene Peterson. 2 ills. 1,250 words. Electrical World. June 16. 10 cts.

Information Concerning Electric Lighting. Reports from more than 200 cities describing station and street line equipment, current generated or bought, connected load statistics and operating expenses. 13 pages. Municipal Journal. June 21. 10 cts.

Modern Lamps and Industrial Application. The importance of modern lamps in the industrial field. By C. E. Clewell. 12 ills. 2,700 words. Electrical World. June 9. 10 cts.

Progress in the Use of Electricity. Reduction in cost of plant. Nitrogen filled lamps. Power for heating and cooking. From a paper by W. R. Collier. 1,600 words. Municipal Journal. June 21. 10 cts.

Miscellaneous:

Precautions in Fuel Oil Storage. Underground tanks enclosed in concrete are most desirable for storage in small plants. By P. A. Colwell. 2,000 words. Power. June 26. 5 cts.

Electricity in Construction Work. Deals with the characteristics and horsepower requirements of the machines used in outdoor construction work. By H. O. Stewart. 14 ills. 3,000 words. Electrical Review. June 2. 10 cts.

Treatment of Pole Butts. Materials used for prolonging their life. Applying by brush and by open tank process. 2 ills. 1,250 words. Municipal Journal. June 21. 10 cts.

Measurement of Ground Resistance. Data on actual resistance found in over 30 cities. 6,000 words. Electrical Review. June 16. 10 cts.

Transmission-Line Formula. Method of making calculations involved in design of direct current transmission system. By E. M. Richards. 1,500 words. Power. June 12. 5 cts.

Reclamation Pumping a Profitable Power load. By R. M. Boykin. 4 ills. 3,000 words. Electrical Review. June 2. 10 cts.

Street Railway Negative Return System for the Mitigation of Electrolysis. By L. E. Herdt and E. G. Burr. 2,750 words. The Canadian Engineer. June 14. 15 cts.

Oil Engines:

Oil Engines as a Relief Against Coal Prices. Advisability of considering them as a means to reduce standby expenses. Characteristics of various types of internal combustion engines and their different fields of application. By A. A. Potter. 5 ills. 2,000 words. Electrical World. June 9. 10 cts.

Power Plants:

Cooperation Between Central Stations and Private Power Plants. By P. R. Moses and W. F. Schaller. 9 ills. 5,000 words. Power. June 12. 5 cts.

Interconnected Hydroelectric Systems. Washington Power Company operates 4 generating stations. 7 ills. 3,500 words. Electrical Review. June 16. 10 cts.

The Seattle Hydro-Electric Plant. Interesting features of the plant now serving Seattle and details of the new construction work which is to be undertaken. By W. A. Scott. 4 ills. 2,200 words. Electrical Review. June 9. 10 cts.

Canton Substation for Receiving Power from Windsor Plant. A substation with all high tension equipment, a capacity of 50,000 kva., and the largest synchronous condensers ever built. By F. H. Bernhard. 5 ills. 4,000 words. Electrical Review. June 9. 10 cts.

FIRE.

Standard Schedule for Grading Cities and Towns of the United States with Reference to Their Fire Defenses and Physical Conditions. 1,500 words. Fireman's Herald. June 30. 5 cts. 1,500 words. June 2. 5 cts. 1,500 words. June 16. 5 cts. 2,000 words. June 9. 5 cts. 1,200 words. June 23. 5 cts.

Suggested Regulations for Fire Drills. The first of a series of articles dealing with the subjects of fire prevention, fire hazards, fire extinguishment, etc. By E. F. Croker. 1,000 words. Safety Engineering. June. 25 cts.

Proposed Standard Pension Plan of Illinois. 2,500 words. Fireman's Herald. June 23. 5 cts.

Two-Platoon Project at Portland, Ore. 1,200 words. Fire and Water Engineering. May 30. 10 cts.

Motor Apparatus in Fire Departments. 2 pages. Municipal Engineering. June. 25 cts.

STREET CLEANING AND REFUSE DISPOSAL.

Garbage and Refuse:

Refuse Collection and Incinerator Design. Choosing collection equipment and selecting incinerator site. Capacity of plant, details of the building and the chimney, provision for storing refuse and requirements to be embodied in contracts. By C. G. Peterson. 2,200 words. Municipal Journal. June 7. 10 cts.

Saving Expense in Garbage Collection. A study of actual conditions in Billings, Mont. By J. N. Edy, Co. Surveyor. 7 ills. 4,000 words. Municipal Engineering. June. 25 cts.

Specifications for Domestic Garbage Incinerators. By C. C. Myers. 2 ills. 2,500 words. Gas Age. June 15. 15 cts.

Extracting Alcohol from Garbage Would Conserve Vast Quantities of Grain and Potatoes. Experiments at Columbus reduction works promise a profit of $1.34 from alcohol per ton of garbage. Plant to treat 20,000 tons annually can be operated for $29,260. 1 ill. 1,100 words. Engineering News-Record. June 14. 15 cts.

Street Cleaning:

Street Cleaning in New York. Increase and improvement in service and decrease in cost during the past three years. How these were secured. 3,000 words. Municipal Journal. June 7. 10 cts.

Street Cleaning in Philadelphia. Antilittering campaign reduces amount of cleaning to be done. Cleaning and ash removal done by contract. Hose and machine flushing. Use of motor vehicles. 3 ills. 3,250 words. Municipal Journal. June 14. 10 cts.

Street Cleaning Costs in Philadelphia. 600 words. Municipal Journal. June 28. 10 cts.

Methods and Costs of Street Cleaning and Waste Disposal in Philadelphia. 7 ills. 3,000 words. Good Roads. June 23. 10 cts.

Work of the Philadelphia Bureau of Highways and Street Cleaning in 1916. 5 ills. 3,000 words. Good Roads. June 16. 10 cts.

Motor Vehicles the Key to New York Street Cleaning Problem. Abstracts from annual report of commissioner. 4 ills. 2,200 words. Engineering News-Record. June 7. 15 cts.

MOTOR VEHICLES.

Electric Vehicles for Central Station Service. Advantages of electric trucks for this work. About 1,400 are now used by central stations. Performance, fleet make-up and costs for some of the larger stations. From a paper by Arthur Williams. 8 ills. 4,500 words. Municipal Journal. June 21. 10 cts.

Commonwealth Edison Company to Establish Electric Truck Service. By E. W. Lloyd. 1,000 words. Electrical Review. June 2. 10 cts.

Economies Effected by Electric Refuse Truck. Results in Dover, England. 1 ill. 1,000 words. Electrical Review. June 9. 10 cts.

Electric Vehicles Lower Cost of Coal Delivery. Experience in England. 1 ill. 800 words. Electrical Review. June 2. 10 cts.

New York's Fleet of Municipal Gas-Electrics Saves $71,345 Yearly. Motor vehicles used for all work in model district. Replace 127 horses. 6 ills. 4,000 words. Commercial Vehicle. June 1. 20 cts.

Military Influence on Motor Truck Design. References and completed specifications. By H. D. Church. 30 pages. Journal of the Cleveland Engineering Society. May. 50 cts.

Bids on Army Trucks. Over 100 makes enter proposals. List of complete bids. 2,200 words. Commercial Vehicle. June 15. 20 cts.

Quick Unloading Bodies Save Idle Time. One type dumps 5,000 brick and another discharges at both sides. Stock bodies for adapted Fords. 6 ills. 1,000 words. Commercial Vehicle. June 1. 20 cts.

Labor Economy of Industrial Trucks and Tractors. Data on labor saving and cost of operation. 3 ills. 2,000 words. Electrical World. June 30. 10 cts.

BRIDGES.

Tendencies in Bridge Construction. Increase in loading, simplication of trusses, carbon steel, floors and continuous bridges. 4 ills. 2,500 words. Engineering News-Record. June 14. 15 cts.

Design and Construction Details of a Long Concrete Arch Bridge. Describes the general design and the details of construction of a bridge with eight arches of 52 to 88-foot span. Concrete handled in dump cars and sometimes placed during cold weather. By C. D. Hale. 2 ills. 1,500 words. Cement and Engineering News. June. 10 cts.

Cellular Slab Highway Bridge. New design adopted by the Minnesota highway department. 1 ill. 500 words. Municipal Journal. June 7. 10 cts.

Link Expansion Joints Work on Concrete Viaduct at Denver. 2 ills. 500 words. Engineering News-Record. June 21. 15 cts.

Three-Hinged Arch Highway Bridge Built of Timber. Redwood most economical material at remote site—design favors low cross-bending strength—arches erected by overhead cables. By F. W. Haselwood. 4 ills. 1,800 words. Engineering News-Record. June 21. 15 cts.

Bascule Bridge at Syracuse Typical of New York Canal Crossings. Skew of 23° led to using fixed floor over counterweight pit. Small movable sections along girders provide clearance. By A. G. Hayden. 5 ills. 1,500 words. Engineering News-Record. June 28. 15 cts.

Cost Keeping System for Small Bridge and Culvert Jobs. 4 ills. 1,000 words. Enginering and Contracting. June 27. 10 cts.

Erecting 480-ft. Span of Burlington Bridge. Substructure built with floating plant. Pier cribs set by triangulation. Steel delivered on the ice. 2 ills. 1,000 words. Contracting. June. 20 cts.

A "Freak" Bridge in Wichita, Kansas. A concrete arch. Design selected for permanance and sightliness. By P. L. Brockway. 5 ills. 2,000 words. Concrete. June. 20 cts.

Erecting 775-ft. Spans of the Sciotoville Bridge. Unusual method of erecting the longest simple truss spans in the world. 2 ills. 1,000 words. Contracting. June. 20 cts.

STRUCTURAL MATERIALS.

Utilizing Oversize Material to Increase Output of Small Gravel Plant. 6 ills. 1,500 words. Engineering and Contracting. June 20. 10 cts.

Changes in Sand and Gravel Plant Treble Output. 1 ill. 300 words. Engineering and Contracting. June 20. 10 cts.

7-Day Sand Tests No Criterion for 6-Months' Test. Sand proved unacceptable with different brands of cement in short time tests, but passes tests at end of half year. By L. R. Brown. 1,250 words. Engineering News-Record. June 7. 15 cts.

Steel Column Tests Establish Principles of Strength. Over 200 tests made at Bureau of Standards. Strength found to depend on compressive yield-point of the steel. 5 ills. 4,000 words. Engineering News-Record. June 28. 15 cts.

The Use of Cement in Bulk. 700 words. The Canadian Engineer. June 21. 15 cts.

Gravel Plant Substitutes Electricity for Steam Power. 2 ills. 500 words. Engineering and Contracting. June 20. 10 cts.

Pneumatic Concrete Mixing and Conveying in New York Subways. Improved machines installed for lining tunnels expedite the work by eliminating obstructions and simplifying plant and operation. 5 ills. 1,500 words. Contracting. June. 20 cts.

Effect of Hydrated Lime on Essential Qualities of Concrete. By Norman G. Hough. 4,000 words. Journal of Engineers Club of Baltimore. June. 25 cts.

MISCELLANEOUS.

Lake Shore Protection at Chicago Being Built of Concrete. By M. D. Blumberg. 4 ills. 1,750 words. Engineering News-Record. June 14. 15 cts.

Lake Port Improvements Many and Varied. Canvass of work under way. 2,500 words. Engineering News-Record June 14. 15 cts.

River Front Improved Without Cost to Taxpayers. Leasing of filled land at Davenport pays interest on bonds and forms fund for retiring them. 4 ills 1,200 words. Engineering News-Record. June 7. 15 cts.

How to Keep a Construction Camp Clean and Sanitary. Rules adopted for Alaskan railway work have general application on all construction jobs. 1,200 words. Engineering News-Record. June 7. 15 cts.

Accidents on Construction. What they cost and how to prevent them. By J. J. Rosenthal, Safety Engr., Industrial Accident Commission of California. 13 ills. 1,800 words. Enginering News-Record. June 7. 15 cts.

Build Wood Training-Camp City for 5,000 Officers in Three Weeks. All constructed principally by day labor under direction of quartermaster at Ft. Benjamin Harrison, Ind. Motor trucks deliver timber. 3 ills. 1,250 words. Engineering News-Record. June 7. 15 cts.

Attempts to Eliminate Dangerous Railroad Crossings. California Commission makes recommendations to lessen accidents. 700 words. Enginering News-Record. June 28. 15 cts.

(*Continued on page 45.*)

NEWS OF THE SOCIETIES

Calendar of Meetings.

July 10-12.—MUNICIPAL LEAGUE OF INDIANA. Annual convention, Shelbyville, Ind. Secretary, W. S. Jones, City Clerk, Shelbyville.

July 12, 13.—LEAGUE OF MICHIGAN MUNICIPALITIES. Annual convention, Grand Rapids, Mich. Secretary, Charles A. Sink, Ann Arbor, Mich.

July 24-27.—DOMINION ASSOCIATION OF FIRE CHIEFS. Annual convention, Port Arthur and Fort William, Ont. Secretary, James Armstrong, Chief, Fire Department, Kingston, Ont.

July 30-Aug. 3.—SOUTHERN SOCIOLOGICAL CONGRESS. Annual meeting, Blue Ridge, N. C. Secretary, J. E. McCulloch, 508 McLachlen Bldg., Washington, D. C.

Aug. 1-3.—AMERICAN SOCIETY OF SANITARY ENGINEERING. Annual meeting, Grand Rapids, Mich. President, William C. Groeninger, Ohio State Board of Health, Columbus, O.

Aug. 6.—PACIFIC COAST ASSOCIATION OF FIRE CHIEFS. Twenty-fifth convention, Anaconda, Mont. Secretary, ex-Chief H. W. Bringhurst, Seattle, Wash.

Aug. 15-17.—LEAGUE OF WISCONSIN MUNICIPALITIES. Annual convention, Racine, Wis. Secretary, Ford H. MacGregor, Madison, Wis.

Aug. 21-23.—NEW YORK STATE FIREMEN'S CONVENTION, Flushing, N. Y. Secretary, Thos. Honohan, Frankfort, N. Y.

Aug. 22.—UNION OF NEW BRUNSWICK MUNICIPALITIES. Annual convention, St. John, N. B. Secretary, James King Kelley, St. John.

Aug. 27-29.—UNION OF CANADIAN MUNICIPALITIES. Annual convention, London, Ont. Secretary, W. D. Lighthall, K.C., Westmount, Que.

Aug. 29-31.—UNION OF NOVA SCOTIA MUNICIPALITIES. Annual convention, Truro, N. S. Secretary, Arthur Roberts, Bridgewater, N. S.

Aug. 29-31.—ONTARIO MUNICIPAL ASSOCIATION. Annual convention, Toronto, Ont. Secretary, B. H. Spence, 705 Lumsden building, Toronto, Ont.

Sept. 5-8.—LEAGUE OF AMERICAN MUNICIPALITIES. Annual convention, Gary, Ind. Secretary, Robert E. Lee, City Hall, Baltimore, Md.

Sept. 11-13.—AMERICAN ASSOCIATION OF PARK SUPERINTENDENTS. Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash.

Sept. 11-14.—NEW ENGLAND WATERWORKS ASSOCIATION. Annual convention, Hartford, Conn. Secretary, Willard Kent, 715 Tremont Temple, Boston, Mass.

Sept. 18-20.—LEAGUE OF VIRGINIA MUNICIPALITIES. Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—LEAGUE OF CALIFORNIA MUNICIPALITIES. Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Sept. 25-27.—SMOKE PREVENTION ASSOCIATION. Annual convention, Columbus, O. Secretary, Frank A. Chambers, City Hall, Chicago, Ill.

Sept. 27-29.—AMERICAN AND CANADIAN ENGINEERS AND ARCHITECTS OF NORWEGIAN BIRTH OR DESCENT. Informal congress and re-union, Chicago Norske Klub, Chicago, Ill. Chairman, Committee on Arrangements, Joachim G. Giaver, consulting engineer, Chicago, Ill.

Oct. 15-17.—NATIONAL HOUSING ASSOCIATION. Annual conference, Hotel La Salle, Chicago, Ill. Secretary, Lawrence Veiller, 105 East 22d St., New York City.

Oct. 17-18.—LEAGUE OF MINNESOTA MUNICIPALITIES. Fifth annual convention, St. Cloud, Minn. Secretary-treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Nov. 19-24.—CITY MANAGERS' ASSOCIATION. Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—NATIONAL MUNICIPAL LEAGUE. Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton Rogers Woodruff, 703 North American Bldg., Philadelphia, Pa.

Nov. 20-23.—PLAYGROUND AND RECREATION ASSOCIATION OF AMERICA. Recreation Congress, Milwaukee, Wis. Secretary, H. S. Braucher, 1 Madison Ave., New York, N. Y.

Connecticut Association of Engineers.

At the convention held at Portland, Me., June 23, officers were elected as follows:

President, W. H. Brown, Meriden; vice-president, A. Anderson, Bridgeport; conductor, James Tobin, Bridgeport; doorkeeper, David Wilcox, Hartford; trustees, Elmer E. Thomas, New Haven, Warren Goodrich of Bridgeport and James McGee of Hartford. Papers on technical subjects were read by B. H. Kearney, C. H. Andrew and C. G. Richardson.

League of Louisiana Municipalities.

Following was the program for the third annual convention of the League of Louisiana Municipalities, which was held in New Iberia June 29-30, as announced by Mayor Elam of Mansfield, who is president of the league:

Friday, June 29.

9:00 a. m.—Address of Welcome—Hon. H. S. Sealy, New Iberia; response, Hon. Alex Grouchy, Jr., Baton Rouge, president.

10:00 a. m.—Reading of minutes, report of treasurer, report of secretary.

11:00 a. m.—"Municipal Ownership a Success"—Hon. W. W. Whittington, Jr., Alexandria.

11:30 a. m.—"Municipalities and Agriculture"—Dr. W. R. Dodson.

12:30 p. m.—Adjourn for lunch.

1:00 p. m.—"How the League's Service May Be Improved"—Hon. Leon I. Kahn, Shreveport.

1:30 p. m.—"Public Schools—Community Builders"—Hon. T. H. Harris, state superintendent public education.

2:30 p. m.—"Municipal Assessments"—Member State Board of Affairs.

3:30 p. m.—"Creating the Community Spirit"—General discussion.

4:30 p. m.—"Administrative Problems"—General discussion.

5:30 p. m.—Meeting of executive committee.

Evening entertainment by city of New Iberia.

Saturday, June 30.

10:00 a. m.—Recommendations of executive committee.

10:30 a. m.—Question box.

11:00 a. m.—"City and Country Interests Identical"—Hon. Martin Behrman, New Orleans.

12:00 m.—"Statewide Co-operation"—Hon. John McW. Ford, Shreveport.

1:00 p. m.—Adjournment for lunch.

2:00 p. m.—Address—Hon. Harry D. Wilson, commissioner of agriculture.

2:30 p. m.—Report of auditing committee, election of officers, selection of city for 1918 convention, unfinished business, adjournment.

Entertainment by city of New Iberia.

Ohio Firemen's Association.

Among the important papers presented at the first annual meeting of the association, held at Springfield, O., June 26-27, were the following:

"Pensions," by Chief T. J. McFarland, Marion; "Standardizing of Hose Couplings," F. M. Griswold, New York; "Automatic Sprinklers As An Aid to Fire Departments," Paul Mason, New York; "Motorized Efficiency," Chief James Fitton, Bellaire; "Spontaneous Combustion," Chief John A. Welsh, Columbus. Other topics of interest will be treated by Captain Sidney Jackson, Dayton; T. Alfred Fleming, state fire marshal and Captain J. J. Conway, of Cincinnati.

North Carolina Good Roads Association.

Because of the fact that a number of the members of the North Carolina Good Roads association are members of the State Press association, which was to meet at Wrightsville Beach, near Wilmington, on June 27, 28 and 29, it was decided to change the dates of the meeting of the road convention here to Monday, Tuesday and Wednesday, July 9, 10 and 11.

The three principal topics for discussion at the convention this year were:

1. Operation of the laws passed by the legislature of 1917 relating to road building.

2. Road maintenance, with special reference to the use of the automobile tax in maintenance of the state highways.

3. The building of roads of military value.

A significant feature of the convention was the fact that much of the discussion concerned itself, directly or indirectly with questions relating to road building in war time.

Kansas King of Trails Association.

During the last two years this Kansas organization has conducted a campaign for an international highway from Winnipeg, Canada, to the Gulf of Mexico, with an anticipated terminus at the City of Mexico.

Officers of this Kansas association have logged and charted the entire length of a tentative location from Winnipeg to Galveston and San Antonio. The total mileage is approximately 2,100 miles, of which more than 1,000 miles has been marked according to a recognized standard. The utmost care has been exercised to locate this highway along natural lines of travel, with the sole purpose of linking together centers of population along the shortest and best routes, and not one mile has been located in con-

sideration of any payment of money by any community or persons.

Deeming that this work has reached a stage where it ought to be encouraged and promoted by a great international organization, there was issued a call for delegates to assemble in Kansas City, Kan., July 11 and 12, 1917, for the purpose of perfecting a permanent organization to promote the hardsurfacing of this road, by adopting a constitution, adopting a definite route, electing officers and taking care of such other business as may be rightly come before such a body. The call said:

"Everybody interested in the promotion of good roads will be welcome at this convention; but the control of the preliminary organization will be vested in delegates from counties along the line of the tentative location of the road in proportion to road mileage.

Each county shall be entitled to one vote for each mile of road in the county. Proxies will be permitted, but no person will be permitted to vote more than five votes nor hold proxies for any county outside the one in which he lives.

The president and secretary of the organization issuing this call shall have authority to seat delegates from contested routes on the same basis of representation as above.

Credentials must be signed by the vice president of the King of Trails county organization, or in counties having no King of Trails organization by the chairman of the board of county commissioners or the county clerk."

W. W. Brown is president and Dr J. C. Cornell is secretary of the organization.

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

SEWERS to be constructed by Union City, Pa., were planned by Phillips & Miller, Meadville, Pa.

Geraldine, Mont., is to make STREET IMPROVEMENTS. The engineers are Gerharz-Jaqueth, 514 First National Bank Building, Great Falls, Mont.

Commerce, Okla., is to improve its SEWER SYSTEM. The engineers for the work are the Benham Engineering Company, Oklahoma City, Okla.

The village of Keewatin, Minn., is to construct a CENTRAL HEATING PLANT. The engineer for the project is L. A. Lawson, 2118 Hendon avenue, St. Paul, Minn.

STREET IMPROVEMENTS are to be made by Fullerton, Neb. Plans and specifications were prepared by Bruce & Standeven, 430 Bee Building, Omaha, Neb.

SEWERAGE IMPROVEMENTS are to be made by Marshall, Minn. The consulting engineer for the work is J. H. A. Brahtz, 312 Commercial Building, St. Paul, Minn.

Grenola, Kan., is to improve its ELECTRIC LIGHT PLANT, following the completion of plans by W. B. Rollins & Co., 209 Railway Exchange Building, Kansas City, Mo.

A reinforced CONCRETE BRIDGE is to be built by the city of Fairmont, W. Va. Plans and specifications for the structure were prepared by the Concrete-Steel Engineering Co., designing engineers, Park Row Building, New York, N. Y.

Duquesne, Ia., is considering the improvement of its WATER SUPPLY SYSTEM. At the request of the board of water works trustees, dean A. Marston, of the engineering school at the state university, Ames, Ia., and C. S Nicholson, have been investigating and will make a report and recommendations.

Sanitary SEWERS being constructed by West Frankfort, Ill., were planned by P. B. Wilson, Marion, Ill.

Dodge Center, Minn., is to construct a SEWERAGE SYSTEM, plans being in preparation by J. F. Druar, 312 Commercial Building, St. Paul, Minn.

STREET IMPROVEMENTS are to be made by Ceredo, W. Va. The engineer for the work is F. W. Gesling, Ashland, Ky.

WATER SUPPLY improvements are to be made by Denmark, Wis., according to plans and specifications by W. G. Kirchoffer, 33 Vroman Building, Madison, Wis.

Christopher, Ill., is considering extensive STREET IMPROVEMENTS. The engineer retained on the project is Lee Harper, 14 State street, East St. Louis, Ill.

Nanticoke, Pa., is to build a SEWAGE DISPOSAL PLANT. The consulting engineer for the work is Oliver F. Starr, of the Green-Starr Engineering Co., 1530 Chestnut street, Philadelphia, Pa.

Oswego, N. Y., is fighting a taxpayers' action seeking to restrain it from issuing bonds for POWER DEVELOPMENT. The city's expert witness in the case is John A. Bensel, Albany, N. Y.

Pittsburgh, Pa., is confronted by a number of important PUBLIC UTILITY problems and has decided to retain a number of experts to be paid out of a $75,000 budget appropriated for the purpose. Bion J. Arnold, of the Arnold Company, 105 South La Salle street, Chicago, Ill., is to investigate the STREET RAILWAY situation. Frederick W. Ballard & Co., Cleveland, O., C. W. Pike, Philadelphia, Pa., Edward W. Bemis, Chicago, Ill., and W. E. Reed, Pittsburgh, Pa., are to investigate the ELECTRIC LIGHT RATES. Edward W. Bemis is also to report on the GAS RATES.

Ohio Police Chief's Association.

Chief Hardenstern, of Youngstown, Chief Weingates of Sandusky; Chief Stamberger, of East Cleveland; Chief Stankard, of Elyria, and Chief A. A. King, of Lorain, comprising a board of governors of the Ohio Police Chief association decided at the meeting held at Lorain June 26 not hold the annual convention this year. The meeting was called for the purpose of determining the dates of the convention scheduled to be held in Columbus.

The police chiefs concurred that it would be unwise to hold the annual convention this year under the existing conditions. It was thought that their services were required constantly at home. Assurance was given that the attendance would be small, if the convention was held as planned.

Pennsylvania Chiefs of Police.

J. H. Tillard, chief of police of Altoona, was elected president of the Pennsylvania State Chiefs of Police Association at its annual convention in Philadelphia June 21. Altoona was selected as next year's convention city after a spirited vote. Other officers chosen include: Vice-president, Lona B. Day, superintendent of police, Scranton; secretary and treasurer, Wm. B. Thomas, chief of police, Jenkintown; executive committee, James Robinson, superintendent of police, Philadelphia, chairman; Edward T. Hallissey, chief of police, Haverford Township; Manfred Naar, chief of police, Philadelphia and Reading Railway; Garrett Roach, chief of police, Bethlehem Steel Company, South Bethlehem; J. Edward Wetzel, chief of police, Harrisburg, and M. G. Turney, inspector of police, Pennsylvania Railroad, Altoona. A resolution was adopted thanking Governor Brumbaugh for signing the civil service bill for policemen in third class cities, which was advocated by the association.

PERSONALS

A number of the larger counties of Kansas have sent to the state highway commission their nominations for county engineers, six of which have been confirmed by the commission. The new engineers added to the list already confirmed and the counties in which they will work are: John E. Williams, of Topeka, Shawnee county; J. M. Bradley, of Winfield, Cowley county; A. J. Francis, Jr., of Russell county; Aubert J. Mowry, of Lucerne, Sheridan county, and P. W. Wright, of Holton, Jackson county.

Broderick, James C., chief of the Detroit, Mich., fire department for more

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BOOK REVIEWS

STATE SANITATION: by George Chandler Whipple. Volume 1, 377 pages, illustrated. Harvard University Press, Cambridge, Mass. Price, $2.50.

Professor Whipple, who is also a member of the Public Health Council of the Massachusetts State Department of Health, in this volume begins a complete review of the work of the state board since its establishment in 1869. It is more than a dry record of research significance—it is the story of public health conservation in this country, of the evolution of modern theories and modern methods of health control from the early passive superstitions. It is because the Massachusetts board has been always at the frontier from the very beginning, because the physicians, engineers, chemists and biologists have been leaders in their professions that almost the whole history of preventive medicine and sanitation in this country is reflected in this story. Three objects are given for the book—to record the past work of the board, to revive some of the older writings which would otherwise be lost and to show how the work of the board has fulfilled the ideals set forth in that truly epoch-making document, the "Report of the Massachusetts Sanitary Commission of 1850."

There is more than anecdotal interest in reading of the days in Massachusetts when an epidemic swept the cities almost every year. In 1678, there was a smallpox epidemic in Boston and "sickness and bad seasons were attributed by our pious ancestors to the irreligion of the times, and to their disuse of fasting, and a meeting was held to investigate the causes of God's judgments, and to propose a plan of reformation." In 1721 Dr. Zabdiel Boylston tried to introduce vaccination and "many persons were struck with horror; some thought it was sinning against God, thus to interfere with the disease; and others that, if any patients died, Dr. Boylston ought to be treated as a murderer." Throughout the story we see the growth of scientific knowledge, beneficial legislation and popular education—we can watch the development of that true statesmanship which is concerned with the welfare of the people and of that true enlightenment which encourages that statesmanship and seeks to follow its guidance.

There are three volumes in this work. The first, which is under consideration here, has two parts: The history of the board and the "Report of the Massachusetts Sanitary Commission." The two parts of the second volume contain thirty-four articles selected from the annual reports and monthly bulletins of the board and short abstracts of nearly all of the scientific articles and reports published between 1870 and 1914. Parts V and VI, in the third volume, include a guide to the forty-six annual reports, properly indexed, and a series of biographical sketches of the engineers, chemists and biologists of the board. In the present volume the history is divided into five periods: 1630-1869; 1869-1879; 1879-1886; 1886-1914; 1914-1916. Other chapters are entitled: "Health of the People," "The Anti-Toxin and Vaccine Laboratory," "Protection of the Food Supply," "Protection of the Purity of Inland Waters," "The Lawrence Experiment Station and the State House Water and Sewage Laboratories," "Later Engineering Work," "Cost and Achievements of the State Board of Health," "Personalia" and "State Sanitation." The report of the sanitary commission, 1850, with its plan of the proposed sanitary survey is worthy of earnest study and will bear comparison with the constructive work of the present. Illustrations of men and of engineering work and of comprehensive charts add to the interest of the volume.

We have long needed just such a work as this of Professor Whipple to give perspective of the development of public health thought, to discover the origins of our current theory and practice and to give the feeling of continuity in the progress of the field which everyday work tends to deaden. Professor Whipple's volume should become a standard part of all public health courses in universities and should be on the shelf of every city and state official, sanitarian and sanitary engineer who has more than an official interest in the problems of public health conservation.

PERSONALS

(*Continued from page* 44.)

than 20 years, and a member of the department for fifty years, has resigned. Assistant chief McGraw will become acting chief.

Brooks, J. P., has been elected chief of the Danville, Va., fire department.

Carter, R. O., has been re-appointed chief of the fire department of Bluefield, W. Va. N. D. Dillow is the new chief of police.

Dudley, Warren Preston, secretary of the Massachusetts Board of Civil Service Commissioners since its incorporation in 1884, died June 27 at his home, 14 Oak street, Belmont, Boston, after a long illness.

Hazlehurst, James N., consulting municipal engineer, has lately received a commission as major, Engineer Corps, U. S. Army Reserve, and is now on active duty at Atlanta, Ga., cooperating with the constructing quartermaster on cantonment construction near Atlanta.

Kinney, William M., has just been elected to the executive committee of

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MUNICIPAL INDEX

(*Continued from page* 805.)

Canadian Cantonments All Built by One Contractor. 5 ills. 800 words. Engineering News-Record. June 28. 15 cts.

Drag Line Eliminates Haulage Equipment on Railroad Work. By W. A. Pillans. 2 ills. 1,000 words. Engineering News-Record. June 28. 15 cts.

Labor Conditions and How Contractors See Them. Shortage of supply and shifting of men from place to place constitute difficult problem and chief cause of decreasing efficiency. 2,000 words. Engineering News-Record. June 28. 15 cts.

Convert Team Outfit Into Tractor-Trailer Equipment Where Horses Are Scarce. By L. R. Barnes. 1 ill. 600 words. Engineering News-Record. June 21. 15 cts.

Baltimore's Purchasing System. 500 words. Municipal Journal. June 7. 10 cts.

How High Are Prices? Editorial discussion. 1,000 words. Municipal Journal. June 7. 10 cts.

System in a City Engineer's Office. A simple office record and field system From a paper by Manly Osgood. 3,000 words. Municipal Engineering. June. 25 cts.

Hauling Gravel by Team and Tractor and Comparative Costs. From a paper by O. L. Kipp. 1 ill. 1,000 words. Municipal Engineering. June. 25 cts.

Japanese Masonry Work. By J. L. Harrison. 6 ills. 1,250 words. Engineering and Contracting. May 23. 10 cts.

Size of Mixer and Size of Job on Which Mixer Should be Used. 300 words. Engineering and Contracting. May 23. 10 cts.

Reducing Labor Cost of Masonry. Handling bricks, cement and mortar by automatic carriers. 2 ills. 800 words. Contracting. June. 20 cts.

Some General Principles of Physical Valuation. Abstract of report to the Royal Commission. By Geo. F. Swain. 1,500 words. The Canadian Engineer. June 7. 15 cts.

Methods and Costs of Constructing Cofferdams at St. Marys Falls Canal. 9 ills. 5,000 words. Engineering and Contracting. June 20. 15 cts.

Distribution of Pressure in Earth Due to Concentrated External Load. Results of a series of experiments. Apparatus and method of conducting tests. 8 ills. 2,000 words. Engineering and Contracting. May 23. 10 cts.

Electric Ditching Machine on Railway Construction. 3 ills. 1,100 words. Engineering and Contracting. June 20. 10 cts.

The Kansas City Park System and Its Effect on the City Plan. From a paper by Geo. Kessler. 3 ills. 3,500 words. Good Roads. June 2. 10 cts.

The Engineer in Politics. From a paper by R. G. Dieck. 3,000 words. Engineering and Contracting. June 20. 10 cts.

Government Cantonments and Outline of Form of Contract for Their Construction. 1,200 words. Engineering and Contracting. June 27. 10 cts.

Graphical Determination of the Moment of Inertia of Complex Beam Sections. By W. S. Wolfe. 17 ills. 2,200 words. Engineering and Contracting. June 27. 10 cts.

Scheduling Progress of a Big Construction Job. Method used by the Aberthaw Construction Co., of Boston. 2 ills. 1,500 words. Engineering and Contracting. June 27. 10 cts.

Distribution of Pressures Through Earth Fills. Tests made at U. S. Office of Public Roads. 4 ills. 1,500 words. Engineering and Contracting. June 27. 15 cts.

Electric Shovels. Brings out such characteristics as have a marked bearing on the selection of the type of motor to accomplish the desired result. By H. W. Rogers. 8 ills. 2,350 words. General Electric Review. June. 20 cts.

Organization and Duty of Engineer Troops. By Capt. F. B. Downing. 3,500 words. Journal of the Boston Society of Civil Engineers. June. 50 cts.

New York State and Her Barge Canal. By L. H. Hart. 13 ills. 18 pages. Journal of the Cleveland Engineering Society. May. 50 cts.

Electric Arc Welding. By H. L. Unland. 16 ills. 3,500 words. General Electric Review. June. 20 cts.

Municipal Accounting. The fourth of a series of articles. By E. T. Sampson. 2,200 words. Canadian Municipal Journal. June. 15 cts.

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

RECORDING-DEMAND WATTHOUR METER.

Type RA Westinghouse Device for Permanent Record.

The demand system of metering is becoming general in central station power contracts. With large power requirements, it is common to fix the rate for the service by the time and duration of occurrence of the maximum demand as well as by the amount of this demand. To determine this, a reliable demand meter giving a permanent graphic record is required.

The type RA recording-demand watthour meter, in one unit, measures both the kilowatt-hours consumed and the integrated demand. It indicates on a four-counter dial the total kilowatthours consumed and records in a permanent form the integrated demand over successive predetermined time intervals. It is installed as an ordinary watthour meter and requires no additional apparatus or wiring. The measuring and recording elements are mechanically inter-connected; there are no electrical contacts to become inoperative. The recording element is controlled by an exceptionally high-grade clock having features that make not only for clock accuracy, but for reliability of continuous operation. The measuring element is the standard Westinghouse type OA watthour meter with special gear train.

The type RA recording-demand watthour meter consists of a watthour meter with the usual four-counter register and, in addition, the mechanism for obtaining a graphic record of the demand. The time interval of the meter and the advance of the record paper are controlled by a high-grade hand-wound clock.

Under load, the gear train of the watthour meter advances the counters in the regular manner. At the same time the gear train causes the ink-carrying pen to advance across the record paper in proportion to the energy registered. At the end of a predetermined time interval a stud on the reset wheel releases the pen gear from mesh with the gear train and a balancing weight returns the pen to zero, where it is again meshed with the gear train to repeat its advance during the next time interval. Meters are made for 15, 30 and 60 minute intervals; a meter made for one interval can readily be changed to operate at one of the other intervals.

Irrespective of the time interval of the meter, an operating spring, controlled by the clock, causes the paper to advance one-sixteenth inch every 15 minutes. Thus, if the meter is arranged to have 15-minute intervals, the paper advances just before the pen is reset, so that the pen makes a distinct and readily observed record of the maximum pen travel, showing both the amount of integrated demand, and, by the time calibration printed on the record paper, the time of its occurrence. If the meter is arranged to have 30-minute intervals, the paper therefore advances one 15-minute space between periods, causing an offset mark on the chart at the middle of the 30-minute interval. This offset mark enables the reading of the integrated demand at 15-minute intervals, as well as at 30-minute. Similarly, if the reset wheel is set for 60-minute intervals, three offset marks indicate the 15-minute demands between each regular one-hour demand.

The entire meter is mounted on a cast iron base. The cover is of pressed zinc with dead black finish, and is fitted with a dust-proof gasket. The glass windows over the dial and chart are well sealed. The electrical measuring element consists of the standard Westinghouse type OA watthour meter on its own supporting casting, but without cover. Therefore, the element can be removed from the case as a unit without changing the calibration.

The paper driving mechanism is a metal drum with pins that engage in perforations in the record paper, driven through gearing by the operating spring. The paper, which is furnished in 18-foot rolls (thirty-six days supply), is held on a spindle, and is wound off this on to a drum by the driving mechanism.

The accompanying illustrations show the meter, the mechanism and the record for fifteen and thirty-minute intervals.

The type RA recording-demand watthour meter is made by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

EMERGENCY FIRE TRUCK.

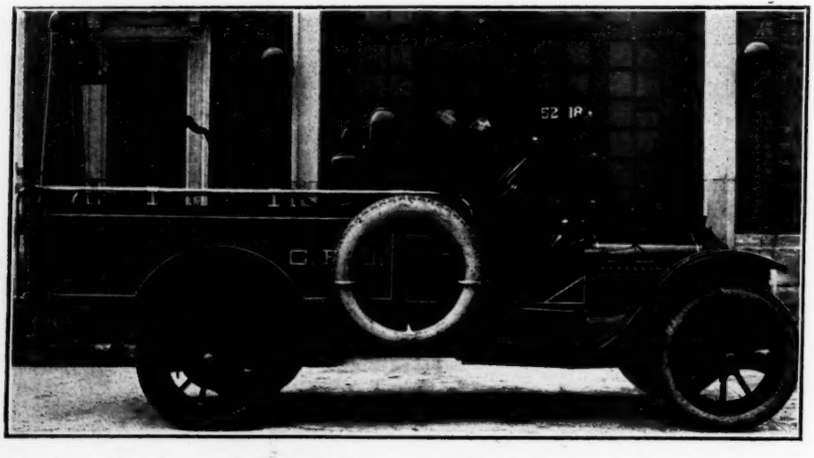
For Repair Work at Fires.

The Chicago fire department is using a new type of emergency truck equipped for the specialized work of repairs to apparatus actually in service at fires. Since its installation six months ago the truck has been on duty twenty-four hours a day and three crews of men have been employed to run it.

Pieces of fire apparatus which break down or become damaged in responding to alarms are quickly repaired or towed to the shops. Wreckage and obstructions of all kinds are cleared up.

Attached to the rear frame is a chain hoist. In the body of the truck is a jack capable of raising twenty tons. A special towing attachment having a coil spring draw-bar makes it easy for this comparatively small truck to pull heavy pumping engines, hook and ladder trucks and other heavy apparatus. Compartments along the sides carry tools of every description, including a strong vice. Two steel tanks are provided for oxy-acetylene welding of parts, the cutting of steel bars, plates and other metal. This work is done by an attendant who is an experienced mechanic and an expert welder.

The truck, which is shown in the accompanying illustration, is made by the White Company, Cleveland, O.



CHICAGO'S WHITE TRUCK FOR FIRE-APPARATUS REPAIRS.

INDUSTRIAL NEWS

Cast Iron Pipe.—Prices continue at the record high levels of last week. While private buying continues to a slight extent, municipal calls have practically stopped. Quotations: Chicago—4-inch, class B and heavier $68.50; 6-inch, $65.50. New York—4-inch, class B and heavier, $68.50; 6-inch,, $65.50. Birmingham—4-inch, class B

and heavier, $63; 6-inch, $60; class A, $1 extra.

The General Filtration Company, Cutler Building, Rochester, N. Y., has just published a new booklet on "Filtros," the porous mineral medium used in waterworks and in the activated sludge process of sewage disposal. The new catalogue contains considerable detailed information on the manufacture, composition, shapes, grades, uses and applications of Filtros. Those superintendents and engineers who have not yet used Filtros will find the new catalogue a good introduction to its properties and possibilities, while those who have already tested it will receive useful information from it regarding particular grades for definite types of service and methods of installation and maintenance. The book is excellently gotten up and well illustrated to cover all points regarding the material.

The Power-Transmission Safety Code presented to the joint meeting of the American Society of Mechanical Engineers and the National Machine Tool Builders' Association in Cincinnati has also been recognized by the National Association of Manufacturers. Copies may be obtained by applying to the American Society of Mechanical Engineers, 29 West 39th street, New York, or the National Association of Manufacturers, 30 Church street, New York.

Summer Course in Concrete Work.—Concrete, as a representative industrial activity, has been one of the recent additions to vocational and industrial arts courses in many schools. As a result of the unusual interest which this work has created, the Portland Cement Association has been deluged during the past year with requests for information about school work in concrete, and a number of teachers expressed a desire to spend time during the summer at some teachers' training school where they would have the opportunity to learn more concerning this new phase of industrial arts work. Several hundred interested industrial arts teachers representing every state in the Union gathered at Lewis Institute, Chicago, for one week of concrete work last summer. This short time spent together proved very profitable to every one, and the meeting was a great clearing house for ideas, suggestions, and data on industrial arts work. The course was practical and at the same time full of information for those who wished to learn the theory and fundamentals of concreting. Mixing and placing concrete, form construction, and the casting and curing of the products were carried out in connection with the various types of concrete work. The breadth of application of industrial fields, coupled with the possibility of unusual interest on the part of the pupil in exercising his originality and ingenuity, has resulted in the establishment of many courses in concrete. The University of Chicago Summer School offers for this year a series of lectures by engineers and teachers thoroughly familiar with the cement industry and the subject of concrete as taught in manual training and vocational courses. These lectures are open, without charge, to every one interested in the subject. They are being given in Belfield Hall, Room 159, the course ending July 23.

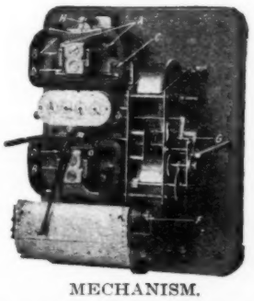
According to a statement by P. J. Lyons, president of the **Bull Tractor Company,** together with this concern and the **Toro Motor Company,** of Minneapolis, will be merged with the **Whitman Agricultural Company,** of St. Louis. The new firm, which will be known as the **Whitman Bull Tractor Company** will have a capitalization of $1,250,000 of 8 per cent accumulated preferred stock and 12,000 shares of common stock. The Minneapolis plant will be moved to St. Louis.

Equipment for Waterworks in India.—A large proportion of the supplies for waterworks and drainage schemes is obtained from the purchasing agent of the Indian Government in London, the director general of stores, India office. The indents are drawn up and forwarded from the government engineers at Madras, and these indents specify the types of articles wanted and the quantities, but local firms which have been approved by the government and which have articles in stock of the desired standard are in a position to compete for the contracts. Firms on the approved list are those which have complied with the government's requirements as to possessing workshops and appliances capable of turning out satisfactory work. These firms, by being familiar with local conditions and knowing what construction work is in progress or projected, and also the types of equipment most likely to be demanded, are often able to obtain contracts. While it is desirable therefore that American manufacturers desiring to offer goods for these contracts should keep in touch with the store department, India office, London, they should also be directly represented in India by an agent, either through one of the local English firms or by an American representative sent out especially for that purpose.

The method of purchasing government stores in India is described on pages 147-151 and 205-214 of "British India, with notes on Ceylon, Afghanistan, and Tibet," Special Consular Series No. 72, obtainable at $1 per copy from the district offices of the Bureau of Foreign and Domestic Commerce, or from the Superintendent of Documents, Washington, D. C.

American firms desiring full particulars as to the water supply and drainage works in progress or projected in the Madras Presidency may obtain them by consulting a copy of Part 1 of the Administration Report of the Department of Public Works for 1915-16 (with a detailed review of civil works and railways), which is obtainable from publishing houses in England. The cost of the publication is $0.28, to which postage should be added.

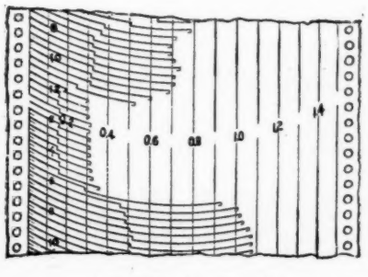
Import Duties on Motor Vehicles and Accessories.—The numerous changes that have been made in the rates of import duty on motor vehicles during the last three years and the restrictions which have been placed upon their importation in certain foreign countries have made it desirable that the information contained in "Tariff Series No. 30, Foreign Import Duties on



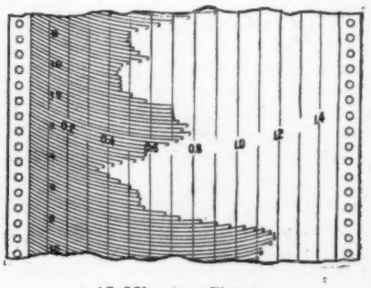
MECHANISM.



WESTINGHOUSE RECORDING-DEMAND WATT-HOUR METER.



30-Minute Chart.



15-Minute Chart.

Motor Vehicles and Accessories," published by the Bureau of Foreign and Domestic Commerce, should be supplemented and brought down to date. With object of making the latest information on the subject readily available to manufacturers and exporters of motor vehicles, including motorcycles and motor trucks and their accessories, there has been prepared a supplement entitled Tariff Series No. 30A, Supplement to Foreign Import Duties on Motor Vehicles and Accessories, correcting the original editon to June, 1917. In general, the supplement reproduces only such tariff items as have been changed, and it should therefore be used in connection with Tariff Series No. 30. Copies of this supplement can now be purchased at 5 cents each from the Superintendent of Documents, Washington, or at the District Offices of the Bureau of Foreign and Domestic Commerce, or the original edition together with the supplement may be secured at 10 cents from the same offices.

Road Building Tractors in Japan.—The Department of Internal Affairs, after an investigation, has decided to improve the roads in this country. Tractors will probably be used. A list of importers of machinery in Kobe and Osaka who might be interested in receiving literature about tractors may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., by referring to File No. 89249.

Lead Production in 1916.—The output of primary refined lead in the United States in 1916, according to a report by C. E. Siebenthal of the U. S. Geological Survey, was 571,134 net tons, against 550,055 tons in 1915, an increase of 3.8 per cent. This is a record. The primary lead available for consumption is given as 477,384 tons for 1916, an increase of 12 per cent over that for 1915, which was 426,364 tons. This is also a record. The exports of domestic lead in 1916 were very large, 100,565 tons, against 87,306 tons in 1915 and 58,722 tons in 1916.

PERSONALS

(Continued from page 45.)

the American Society for Testing Materials.

Lehrbach, Henry G., C. E., has been appointed and confirmed assistant civil engineer in the navy. Mr. Lehrbach was appointed from civil life, one of twenty-five such appointments made by the President on June 21. He is a graduate of the school of engineering of Cornell University and for a time was connected with state highway work in New York, resigning in 1915 to join the engineering staff of The Dunn Wire-Cut Lug Brick Company, of Conneaut, Ohio. He was division engineer of the Atlanta, Ga., division for a time, but later was transferred to the district having headquarters at Columbus, O., a position he was filling when he received his appointment.

State of New York—The Civil Service Commission.

JULY 28, 1917.

1. Open competitive examinations will be held throughout the state on the date mentioned above, for the positions mentioned below. Candidates must execute an application form and file it in the office of the Commission, as above indicated. Accepted candidates will be notified about a week prior to the date set, when and where to appear for examination. No one will be admitted to the examination without the official notice. If an application should be rejected, due notice will be sent. The Commission does not send formal acknowledgment of receipt of application. Candidates in all examinations, unless otherwise specified, must be full United States citizens, by birth or naturalization and in the latter case naturalization papers must be submitted in proof of claim. Unless otherwise specified below, examinations are open to men and women at least twenty-one years of age on the date of the examination. Three months' residence in New York State is usually required. The Commission may, however, suspend the requirements as to residence and citizenship where such requirements are disadvantageous to the public interests. In writing for application form or information, candidates should specify particularly the position as given below, for which they desire to be examined. Send application, properly filled out, sworn to, and with the certificates signed to the "State Civil Service Commission, Albany, N. Y.," as soon as possible after the announcement of the examination.

Application forms will not be sent out by mail after July 16; if they are received at the office of the Commission after July 18 they will not be accepted.

210. Assistant Chemist, Public Service Commission, First District. $1,201 to $1,500. Men only. Candidates must be graduate chemists with at least two years' practical experience. The examination will presuppose a familiarity with analyses of steel and cast iron, cement, asphalt, coal tar pitches, mixed paints, dry pigments, etc., water analysis, gas-testing methods, use of the microscope and general chemistry. Subjects of examination and relative weights: Written examination, 6; education and experience, 4. Open to non-residents.

211. Junior Assistant, Grade 6, Engineering Departments. $901 to $1,200. Men only. Minimum age, 20 years. Subjects of examination and relative weights: Problems in applied mechanics and mathematics, including surveying, elementary structures and hydraulics; questions on surveying and construction practice, and on materials of construction, 3; experience, education and personal qualifications, 2. Open to non-residents. Original appointments are usually made at the minimum salary with opportunity for subsequent increase.

212. Junior Electrical Engineer, Public Service Commission, First District. Salary $901 to $1,200 a year. The duties are to inspect the power houses and equipment of subway, elevated and street railways, lighting and power companies in New York City. Candidates must have had at least three years' training at a technical school of recognized standing and not less than one year's experience in electric railroad or electric lighting work or in the manufacturing or installation of electrical or mechanical apparatus. Subjects of examination and relative weights: Theoretical and practical questions relating to the construction and operation of power house and railway equipment, electric distribution, measurements, standards, and other pertinent subjects, 5; experience and personal qualifications, 3; education, 2. Open to non-residents.

214. Electric Inspector, Public Service Commission, Second District. Salary, $1,200. The duties are to inspect the property, and especially the overhead lines, of electric corporations in New York State outside of New York City, and to compile comprehensive and intelligible reports. Candidates should have a general elementary knowledge of the theory of electricity, generation, transmission, etc., and must have had a high school training or its equivalent, and not less than two years' practical experience of a character such as to give familiarity with the operation of generating stations and with the construction and maintenance of underground and overhead electric lines. Technical education will receive credit as equivalent to experience, graduation from a school of the highest standing being counted as one year's experience. Subjects of examination and relative weights: Written examination, pertaining to the duties of the position, 1; experience and training, 1.

215. Engineering Inspector. State Architect's Office. $1,800 to $2,500 and necessary traveling expenses. The position requires technical knowledge of the following: High and low pressure steam, and hot water heating systems; plumbing, electric wiring and switch board work; house sewage disposal; refrigerator, laundry, and electrical and steam power equipment; materials of construction; testing and testing instruments; machinery foundations; architectural plans and specifications; also practical experience in supervising the installation of machinery, etc., familiarity with the various makes of machinery and apparatus used for the foregoing purposes, and general knowledge of the Underwriters' rules. Graduation or partial course in mechanical or electrical engineering is desirable. Subjects of examination and relative weights: Practical questions, 5; experience and education, 5.

216. Sanitary Engineer., State Architect's Office. $1,800 to $2,500. Applicants must have had at least four years' satisfactory experience in sanitary engineering. Credit will be given for technical education not exceeding one year's practice. The duties of the position will include the design and supervision of the construction of sewage disposal, water supply including filtration, house drainage systems, plumbing fixtures, preparation of specifications. Subjects of examination and relative weights: Written examination, 3; experience, education, etc., 2.

219. Physiological Chemist, State Department of Health. Salary $1,500. Applicants should have a thorough knowledge of the principles of physical, organic and physiological chemistry, and they should have had at least three years' practical experience in physiological or biological chemistry. Candidates will be rated on a written examination relating to the duties of the position, weight, 1; and on their general and special training and particularly their practical experience and personal qualifications as shown by their sworn statements and by answers to such inquiries as the Commission may make of their former employers and others acquainted with their qualifications and experience, weight, 1. Open to non-residents and to citizens of other countries, except those at war with the United States.

222. Examiner, State Department. $1,500 to $1,600. The duties of this position will require men of good judgment who are accurate with figures and have sufficient knowledge of the tax law to enable them to determine and classify the several classes of corporations, to examine and analyze accounts and render conclusive reports thereon. They must also have a definite knowledge as to how to segregate such accounts as legally belong to the credit of this state in an apportionment. Subjects of examination and relative weights: Arithmetical computations including proportion and percentage, 1; questions on the application of those parts of the tax law which relate to the definitions for classification, 1; education, experience and personal qualification, 3.

223. Assessing Clerk, State Tax Department. $1,800 to $2,400. These positions will require ability to analyze and adjust the relations existing between the various elements in reports to the department, particularly as regards tangible personal property and services rendered; to allocate properly such elements as regards the apportionment of net income; to determine the amount to be retained by the state and the portion to be returned to the several counties, cities and towns of the state. This will include a knowledge of Article IX and IX-a of the tax law and a working knowledge of such decisions as are necessary to do such work. Subjects of examination and relative weights: Arithmetical computations including proportion and percentage, 1; questions on the application of those parts of the tax law which relate to the definitions for classification, the allocation of property in and out of the State, and of net income and the redistribution of taxes, 1; education, experience and personal qualifications, 3.